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Europe/Latin America Report

SCIENCE AND TECHNOLOGY

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JPRS-ELS-87-011

5 MARCH 1987

EUROPE/LATIN AMERICA REPORT

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FRG MINISTER COMMENTS ON FUTURE MANNED SPACE FLIGHTS

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 439, 15 Sep 86 pp 4-5

[Text] The German Minister of Research, Dr Heinz Riesenhuber, declared that he is in favor of manned space flights. The D-1 million experience proved that the human being on board cannot be replaced for a long time yet due to his unique capability of observation and judgment. He explained that during the D-1 million, the MEDEA payload element, which was particularly necessary to carry out tasks in materials research, failed to start because the vacuum valve jammed; as a result 10 experiments were ruined. Repairs could have been carried out by scientist-astronauts working with an adequate trouble-shooting program on the ground.

In contrast with the tasks of extraterrestrial research that involves measurement tasks which can be precisely defined beforehand, tasks are carried out in new scientific fields such as fluid physics, materials and bioscientific research, and medical research which require constant observation, assessment, and, if need be, control by experts on board, who are in constant contact with scientists on the earth ground. These remote controlled interventions during experiments cannot be effected through Telescience (i.e., monitoring the experiment on a screen in the earth station) since the costs involved would be too high and the procedures and technology presently available are still inadequate.

Riesenhuber stated there is no proof that manned space flight has to be much more expensive than unmanned. On the one hand, steadily rising payload costs are already forcing constantly increasing reliability of conventional transport systems; on the other, however, the absence of a crew on missions like D-1 would cause a dramatic rise in automation costs. During development of the Spacelab, life-support system costs amounted to 5 percent of total development costs. However, Spacelab can be used for at least 50 missions.

The role of scientists on board will only decline when processes and procedures, for example, in activities related to crystal growth and cell fusion and separation have been understood and mastered for production systems. Only then will it be possible to automate production system missions in space.

8701/9738
CSO: 3698/M022

BRIEFS

BULL RESTRUCTURING--This nationalized company continues its administrative reorganization, consolidating Bull-Micral, Bull-Transac and Bull-SEMS [European Association for Minicomputers and Systems]. This change, which becomes effective on 1 January 1987, is part of Bull's legal reorganization of the past several months. Bull-SEMS, Bull-Transac, and Bull-Micral lost their subsidiary status in December 1985 and were grouped with CII-Honeywell Bull [International Data Processing Co.-Honeywell Bull] to form Bull SA. These three units, each with a different product line, are now jointly managed as Bull MTS [Microcomputers, Terminals, and Host Computers], headed by Georges Grunberg, who was already the director of Bull-Transac and Bull-Micral. From now on, Bull SA will consist of three product divisions: Bull Systems, Bull MTS, and Bull Peripherals. Bull CP 8, however, was made a subsidiary a year ago. The founding of Bull MTS will allow consolidation of the financial departments, joint research, and creation of a single personnel service with joint pay centers. In short, all services which do not need to be decentralized can be merged, Bull says. This internal reorganization "reflects Bull's desire to adapt to new market requirements, particularly the increasingly converging areas of microcomputers, host computers, and terminals," Bull explains. In addition, demand is growing for turnkey systems including hardware, basic software, and--in cooperation with data processing services and engineering companies--application software and associated services. A further explanation can be found in the increasingly complementary nature of activities involved in the development of host hardware and basic software meeting market standards and activities linked to the production of plug-compatible equipment for these host systems. [Excerpts] [Paris ZERO UN INFORMATIQUE in French 22 Sep 86 p 9] [Article by Patrick Haas] 25,024/9599

CSO: 3698/A017

CNR COMMITTEE OUTLINES ADVANCED ROBOTICS PROJECT

Milan COMITATO PER LE SCIENZE DI INGEGNERIA E ARCHITETTURA in Italian 1 Dec 86 pp 1-5

[Paper issued by the CNR Committee for Engineering and Architectural Sciences on 1 December 1986 in Milan: "Finalized Robotics Project: General Lines of the Program"]

[Text] 1. Introductory Remarks

In order to meet the growing demand in several manufacturing areas for operating units based on robotics technology, the National Research Council [CNR] funded as early as 1981 a prefeasibility study for the development of a Finalized Robotics Project [FRP], to be implemented on a national basis.

The commission in charge of the project, set up under the direction of Professor Somalvico and including several experts in the disciplines most directly involved in robotics, carried out its tasks in December 1983, when an interesting plan was produced which met with the approval of large sections of the scientific and industrial community nationwide. The actual proposal contained in the relevant report was later summarized in a more recently published document which was favorably received by the government bodies concerned.

Just as suitable conditions came about to bring the project to the implementation stage, the considerable amount of time elapsed between the conclusion of the prefeasibility study and the date established for its effective implementation suggested the need to reconsider certain aspects of that study in order to check the validity of specific statements and results in the light of the changes that might have taken place during the intervening period. Thus, the Engineering and Architecture Science Committee decided to organize a public discussion of the guidelines for research which had been singled out at the time in order to examine new ideas and opinions concerning the prospects for the immediate implementation of a program which, at the moment, is still to be defined in many details.

Consequently, an open meeting devoted to the discussion of these topics was held in Rome on 14 November, with the attendance of those members of the industrial community who are most directly involved in research and innovation in this sector. While the official invitations had been made on the basis of the information gathered from an initial mail survey, the meeting also attracted several participants from companies other than the ones included in the original list and aroused considerable interest among many of the leading institutions of the scientific community engaged in closely related cultural [culturali] areas.

On this occasion, the participants expressed their wholehearted support for the CNR initiative and for the research trends which had been suggested in the prefeasibility study. Indeed, the consensus was such that at the end of the meeting a motion was passed stating the participants' explicit approval of the established research guidelines and, furthermore, advocating a quick transition to the implementation stage. Despite a few minor changes, the substantial endorsement of the Somalvico report suggested that the proposals contained in that study could be translated into an organic plan in which the established research trends were to be structured through specific subprojects, on the basis of an overall organizational scheme offering a consistent frame of reference for the implementation of the successive stages envisaged by the plan.

The initial implementation of the project poses a number of highly complex problems and calls for the establishment of a functional framework capable of promoting an extensive, far-reaching research program involving several often unrelated scientific and technological fields as well as economic activities in the secondary and tertiary sectors.

2. Goals of the Project

The FRP concerns the domestic scientific and industrial sectors involved in robotics research, design, and applications.

Originally developed as a response to the new demands of the national community--as indicated by the surge of innovative activities undertaken both in the research field and at the industrial level--the FRP aims at gaining new insights and at acquiring the necessary know-how in a number of sectors which are primarily concerned with the design and development of the components and subsystems, both structural and functional, used in the manufacturing of robots for all kinds of applications, both in the more traditional industrial sectors and in the more specific, advanced fields of employment. This, of course, also means focusing on specific problem areas, as long as they are technical, scientific and social issues of general interest.

The achievement of the FRP objectives will lead to a growth in the country's scientific, technical, and economic resources. This, in turn, will create new opportunities to fulfil the increasingly pressing demands of the industrial structure and will contribute to the cultural and professional development of whole segments in the industrial and research sectors.

3. Outline of the Project

On a general level, the FRP is based on a given number of lines of research, the organizational structuring of which is yet to be defined in detail, depending on its specific contents and on a more thorough assessment of the interrelations involved in the underlying approach and in the performance of the relevant research activities.

Given its level of generality, the frame of reference or "grid" resulting from the lines of research shown below may be considered definitive, in that any change in the definition of the targets which may ensue from unexpected events or processes occurring during the period between now and the actual implementation of the FRP could, in any case, be accommodated within the pre-established grid.

In addition, let us note that these research lines should be combined--in the implemention stage--into a certain number of subprojects, the definition of which will establish the relationships of the topics dealt with and the requirements of an interdisciplinary approach. Paragraph 5 offers a few hints as to a possible combination of the lines of research into four subprojects, in accordance with the proposal originally set out in the prefeasibility study.

4. Lines of Research

The following lines of research are to be pursued:

1. Mechanical Architecture of Robots

   Design and application standards in semi-industrial and industrial models. New mechanical models, with a great degree of independence. Structural and functional reliability: diagnostics.

2. Mechanical Components of Robots

   Gripping units, assembly tools, flexible machining tools, movement and locomotion control units.

3. Robot Control Architecture

   Description, size and development of hardware architecture prototypes.

4. Programming Systems

   Development of programming systems and ancillary equipment designed to ensure standardization and conveyability. Offline symbolic programming, also for low-cost robots. Development of prototypes.

5. Artificial Intelligence

   Information display and problem-solving techniques. Sophisticated systems for training purposes. Employment of advanced VLSI technologies. Development and production of application systems.

6. Actuators

   Development and production of actuators, including those based on innovative designs.

7. Sensors

   Development and production of force, position, speed, vision, sound sensors. Cost-benefit balance.

8. Vision Machine

   Electrooptic technologies and digital architectures aimed at the development of image processing algorithms.

9. Control System

   Design and development of geometric and dynamic models for controlling the robots (including new techniques).

10. Robots in the Factory of the Future

    Integration of robots in the manufacturing system. Ergonomic aspects. Monitoring and supervision of the various activities involved in the working cycle.

5. Division of the Project Into Subprojects

The division shown below is based on a combination of the lines of research set out in the preceding paragraph, in accordance with the criteria referred to in paragraph 3.

1. Structure of Robots
   1.1. Mechanical architecture of robots
   1.2. Mechanical components of robots

2. Robot Control
   2.1. Robot control architecture
   2.2. Programming systems
   2.3. Artificial intelligence

3. Robot Transducers
   3.1. Actuators
   3.2. Sensors
   3.3. Vision machine

4. Robot Monitoring
   4.1. Monitoring system
   4.2 Robots in the factory of the future

6. Examples of Expected Results and Products

Structure of robots
--Prototypes of arms;
--Prototypes of gripping and movement control units;
--Structural reliability diagnostics;
--Description and evaluation standards, and assessment of the performance of the machines developed;
--Standardization of materials;
--Records of the geometric models of structures, developed with CAD techniques, for the simulation of robot movements.

Robot Control
--Portable, modular prototypes of explicit robot-programming translators [traduttori];
--Proposal of a standard national robot-programming language;
--Translator programming proposal;
--Expert systems for implicit programming: proposals may be made for the establishment of national standards;
--Expert systems for end-of-movement programming and error correction.

Robot Transducers
--Possible standardization of the control hardware;
--Sensor prototypes;
--Advanced firmware for the control architectures;
--Prototypes of advanced vision machines.

Robot Monitoring
--Nonlinear dynamic system control methods for the arms of the robots;
--Criteria governing the layout of the systems defining the automated factory;
--Hardware architectures for system robot integration, and related standards.
--Prototypes of programming language translators for the production line;
--Software support for automated factory management;
--Systems reliability and diagnostics.

Industrialization of the Results
--Transfer of project results on the industrial scale.
--Development and technical and cultural training of the management and of the operators involved.
--Introduction of robotics into specific fields of application (ecological control, agriculture, marble and stone-cutting industry, off-shores [as published], etc.).
--Introduction of robots into the small manufacturing industries and trades.

Budget Plan

(in billions of lire)

	Years I	II	III	IV	V	Total CNR	Funds allocated by third parties
Total	9.0	11.4	13.8	16.3	18.6	69.1	17.5

Note: Expected average rate of inflation, 5 percent.

Milan, 1 December 1986

8628
CSO: 3698/M135

FIAR VISION SYSTEM DEVELOPED FOR ASSEMBLY LINE AUTOMATION

Milan AUTOMAZIONE E STRUMENTAZIONE in Italian No 12, Dec 86 pp 94-95

[Excerpt] A medium-size company which is moving into the ranks of the large firms and which distinguishes itself by its commitment to innovation is Fiar of Milan, whose capital is mostly in the hands of Swedish shareholders. From military and space electronics, Fiar is expanding into the automated factory sector where it has chosen to introduce advanced products based on artificial intelligence applications. Next year it is forecast that the company will employ 70 technicians rather than the 50 currently in this sector. Artificial vision is the company's strong point. In 1987, the company foresees the marketing of a vision system for the guidance and control of robots suitable for assembly line automation. The system is called Retina and consists of a personal computer (Olivetti M 24) integrated with a special chip, television cameras, and the actual vision system which is able to analyze up to 32 geometric parameters of an object on which the cameras are focused.

The "model" generated by these parameters is compared with the memorized specimen and analyzed to determine variations, defects, or movements that the robot must carry out to correctly manipulate the object. Another new feature of Retina is its ease of programming: from the "host" computer the operator can easily communicate with the system, teach it the commands, calibrate the machine, and even "show" it various sample objects so that Retina can create the standard terms of reference by itself (self-learning).

Therefore, Retina qualifies as a general purpose vision system, and is accessible to non-specialized (although qualified) personnel. It is available at a relatively low cost (around 35 million lire, which triples when the logistical and "surrounding" investments are taken into consideration). The first Retina systems sold in Italy should find applications in the household appliance industry.

8627
CSO: 3698/M139

CAD TOOLS DEVELOPED FOR ANALOG GaAs IC MODELLING

Milan ALTA FREQUENZA in English No 3, May-Jun 86 pp 195-203

[Article by Carlo U. Naldi of the Electronics Department of Turin Polytechnic: "CAD and Modelling for Analog GaAs ICs;" first paragraph is ALTA FREQUENZA introduction]

[Text] Computer-aided design is today an indispensable tool for the development of MMIC's; in fact, it permits to speed up the design of the circuit significantly reducing its cost. Accurate models for both passive elements and active components are needed, taking into account as much as possible the actual technology involved in circuit implementation. On the other hand, CAD suited models should allow a simple and fast numerical implementation. In order to achieve both aims, rigorous approaches such as full-wave electromagnetic analysis for passive elements and physical models based on semiconductor equations are proposed as CAD tools to generate simpler equivalent circuits liable to be embodied in simulation and design programs. As far as passive circuits are concerned, equivalent waveguide models are used in order to have a flexible analysis instrument. CAD tools for device development amount to the solution of carrier transport equations within the cross section of the device by means of a suitable numerical technique.

The models being worked on will be included in a CAD library for MMIC analog circuits developed within the framework of the ESPRIT project of the EEC.

I. Introduction

Computer-aided design (CAD) is today an indispensable tool for the development of microwave circuits. This is particularly true for monolithic microwave integrated circuits (MIC), where the customary design procedures like component adjustment and trimming are of limited use or too expensive. One could say that the initial development, around 1970, of microwave integrated circuits has been made possible thanks to the availability of high quality gallium arsenide and to the development of adequate CAD tools. Owing to the high cost of an

integrated microwave prototype it is both desirable and convenient to assist every stage of circuit development by computer simulations. However, the instruments needed to a MIC-suited CAD, such as component characterization, component models, analysis and design numerical techniques, cannot be based upon highly idealized components, as it happens in some general-purpose CAD programs, but must take into account the actual technological processes involved in circuit realization.

For the sake of simplicity, the whole computer-aided design process can be split up into several steps (Figure 1). As a first step, passive and active elements must be characterized either by means of rigorous theoretical methods (analytical or numerical) or by computer-assisted measurements. In this phase, models are often employed which, owing to their complexity, lead to rather time-consuming numerical implementation, unsuited for repeated use within a design program. Therefore, as a second step, the data generated in the first phase must be transferred into CAD suited models. As a third step, the network used for MIC simulation must be analyzed; the analysis should be accurate enough to account for hidden effects, like--for instance--spurious coupling between elements.

In the last two steps, an optimization of design parameters is carried out and layout masks are generated. Second-level adjustments operating on the whole process can be obtained, through more elaborate statistical tools. Sensitivity analysis and layout optimization with respect to random variations of technological or model parameters fall into this class.

Several among the afore-mentioned aspects which are still open to investigation, are the object of an ESPRIT sub-project: "CAD methods of analog GaAs monolithic ICs," whose aim is to develop and tune up CAD tools for integrated GaAs circuits and, more specifically, a library of passive and active components. The ESPRIT sub-project has as a prime contractor TELETTRA and as partners CISE, Politecnico di Torino and SIEMENS.

2. Models for Computer-Aided Design [1-5,19]

Models for a CAD library can be either analytical or numerical (Figure 2). We call analytical all models leading to analytical expressions, which can be obtained either by curve fitting from measured or computed data banks, or directly from theoretical analysis based on component physics. Numerical models, on the contrary, do not lead directly to closed-form expressions, but try to characterize the component by solving, through numerical techniques, the basic equations governing its physics. For passive elements, such a basic model is given by

Maxwell equations; for active components, by carrier transport equations solved in a two-dimensional or three-dimensional domain.

Suitable numerical techniques can be in the first case space-domain or frequency-domain moment method, in the second case finite differences or finite elements. In spite of the high standard achieved today in computer speed, numerical models, though more accurate, are still too time-consuming for direct inclusion in a CAD program. Analytical models are therefore best suited for CAD applications. However, their generation is not trivial; in fact, it requires either proper theoretical simplifications, which are not always feasible, or, more often, the use of multidimensional fitting programs on data banks to be generated through numerical approaches. Within the ESPRIT project, numerical methods are used to generate the data needed to the construction of explicit formulas or equivalent circuits. Experimental validation of the proposed models is also considered.

Owing to their different treatment, a definite distinction can be drawn between models of active and passive elements (Figure 3). Among passive elements, a further distinction can be made between distributed elements, like transmission lines (microstrips, coplanar lines, slot lines) and coupled structures (meander lines, couplers, distributed filters) and lumped elements, such as resistors, capacitors (MIM and interdigitated) and spiral inductors (circular or rectangular). Transmission line discontinuities fall in an intermediate class.

3. Transmission Lines [5-8]

Despite more recent solutions, microstrip is still the customary transmission line for MIC applications (Figure 4), not only or its intrinsic merits, but also for the large amount of related information and experience available. Coplanar lines have a more restricted field of application, even if considerable effort has been devoted to extending to them CAD tools already available for microstrip design. Possible advantages of coplanar lines are reduced dimensions, ease of series and parallel component insertion, performances nearly independent of substrate thickness. Disadvantages are: greater frequency dispersivity, reduced power handling capabilities, and more complex circuit layout. Some of these drawbacks are eliminated by the introduction of a lower ground plane (conductor backed coplanar lines).

A significant contribution to the analysis of coplanar lines has been given by Politecnico di Torino; CAD suited analysis and design formulas have been developed for a large class of coplanar lines and validated by comparison with more general numerical approaches.

As an example, design formulas and design chart are shown for coplanar

lines with finite substrate (Figure 5); the same for conductor backed coplanar waveguide (Figure 6).

4. Discontinuities [9-15,19,26]

Line discontinuities is a field where a great amount of work has still to be done, above all in the domain of non-microstrip lines.

Characterization of microstrip discontinuities can be carried out according three main approaches (Figure 7): the quasi static, the dynamic applied to an equivalent closed structure, and the full wave dynamic. In the first one, discontinuities are characterized by means of their equivalent static parameters, such as capacitance and inductance. This approach yields good results far from the onset of resonances or higher order modes, but fails completely beyond these limits (Figure 8).

For GaAs substrates in MIC applications, however, this limit is higher than for alumina circuits. The lumped approach seems to be well suited for CAD since it amounts to the computation of simple analytical formulas. A wide literature exists on the subject, although most of the work performed in the past concerns alumina or telfon substrates.

The dynamic approach applied to an equivalent waveguiding structure (Figure 7) is a step toward the exact solution of the problem: a proper closed waveguide replaces the original line, and the properties of the discontinuity are computed by means of numerical approaches, such as mode matching or line-integral formulation. However, the time-expensiveness of these methods makes them unsuitable for direct application in CAD. This difficulty can be overcome by extracting interpolating formulas easy to compute from results obtained with the more rigorous approach. Finally, the full-wave dynamic approach works directly on the open structure, but is very computationally intensive, since it requires the solution of three-dimensional integral equations. This last approach can be the only one valid in the frequency range where surface-wave and radiation phenomena become essential.

On the whole, the characterization of discontinuities looks like a formidable task, due to their complex frequency behavior; nevertheless, discontinuties are simply not used in frequency ranges (Figure 8) where their behavior becomes highly resonant. A complete analysis tool should permit to decide whether or not a given discontinuity can be used in a certain frequency range.

5. Lumped Components [16-19]

Lumped-parameter elements can be thought as short waveguiding

structures. A full wave characterization is rather cumbersome and must account for the presence of both radiation and conductor losses.

Once again, the aim of modeling is to obtain easy-to-handle analytical expressions. In this direction go the efforts of ESPRIT program (mainly SIEMENS and MCAD Figure 9).

6. Physical Models for Active Component [20-23]

CAD oriented analysis of active components, such as GaAs field-effect transistors or other devices suited for MIC applications, poses two sorts of problems (Figure 10). On one hand, fast models are required to be embodied in a more general CAD program. Physical intuition and knowledge of the processes taking place within the device can considerably help in devising such models, but having a simple large-signal analytical model whose parameters are only determined by geometrical or physical data is often illusory, since a good deal of fitting is needed to reproduce the behavior of such or such device.

A full black box model, where coherence with experiment is automatically achieved, seems therefore more attractive. On the other hand, the design of the device itself needs its own CAD tool. Such a tool should be able to yield reasonably accurate predictions about the influence of the physical parameters of the device (such as: geometrical dimensions, material characteristics, doping profile) on its electrical performances (V-I curves, small signal and large signal behavior, noise figure) and even on its non-observable parameters (internal field and carrier distribution, high-field and breakdown regions and so forth).

Both aspects (the CAD oriented lumped model and the physical model) are being dealt with within the ESPRIT program; the first one by SIEMENS, the second one by Politecnico di Torino with the technological support of TELETTRA. From now on, we shall confine ourselves to the physical model.

In a physical model, the basic equations governing the behavior of carriers are directly solved within the device with proper boundary conditions (Figure 11). Several degrees of approximation are possible when deciding what is the physical model to be evaluated. General speaking, carriers are subject to Boltzmann's equation, where f is the carrier distribution in the 6-dimensional position-momentum space. Since this equation cannot be solved directly, statistical simulation techniques (Monte Carlo) are needed to describe the carrier behavior. However, in spite of encouraging successes, Monte Carlo simulation is still extremely computer-time consuming. Simplifications are possible if "fluido-dynamic" equations are extracted by computing the moments of

Boltzmann equation.

Transport equations concerning physical quantities of interest, like charge density, energy, momentum, and so on, according to the momentum order, are obtained. The customary (first order) model for semiconductor simulation includes carrier continuity equations, coupled with Poisson equation. Nevertheless, more complex models introducing momentum and energy transport equations have found some diffusion in the field of MESFET modeling. However, they are almost time consuming as full Monte Carlo techniques, and therefore their usefulness is not fully established. The first-order model (Poisson-Continuity equation) is accurate if non-stationary effects like overshoot are absent. Time-dependent and space-dependent phenomena can be thought of as stationary if space and time variations are not too abrupt. On the other hand, nonstationary effects play an important role in devices with gate lengths much less than half a micron; their impact on 1 micron gate devices is still controversial.

7. First-Order Two Dimensional Simulation [19,23-25]

Physical device simulation is at least two-dimensional, that is, the basic equations are solved within the cross-section of the device (Figure 13). The domain where two-dimensional simulation can be really valuable is the technological device development; in fact, this tool allows the designer to explore new geometries, doping profiles, and device structures without having to resort to time-consuming and expensive prototype development. Owing to the great accuracy and sensitivity achieved by device simulation with respect to both material characteristics (initial mobility, threshold field, saturation velocity), geometrical parameters (electrode spacing, recess depth for recessed gate devices) and doping profile, a meaningful comparison between simulation and experiment poses measurement problems for some critical parameters (for instance, doping profile and depth of gate recess) but also identification problems, since some of the parameters involved are not observable, like the threshold field. However, good agreement between measured and simulated data can be obtained in most cases with reasonable parameter fitting.

The physical model simulator developed by Politecnico is based on the solution of the coupled Poisson-Continuity equations by means of the so-called Gummel iterative technique. The discretization used in the program is finite elements with polinomial basis functions on triangular elements for Poisson equation, finite-differences on a triangular grid for continuity equation. This mixed scheme has proven to be the most effective, and allows simulation with comparatively coarse grids. The simulator can provide both the static (dc) and the small-signal behavior. Such features can provide the designer of

physical insight on the hidden mechanisms of the device, thereby giving qualitative and quantitative understanding about how to modify the device itself in order to change its performances.

Some results will be presented in order to highlight aspects of device operation that cannot be properly accounted for by means of simpler (mono-dimensional) simulations.

The presence of a buffer layer is usually neglected in mono-dimensional models, and was also not considered in the earliest two-dimensional simulations. Nevertheless, a proper modelling of the transition between active layer and buffer is essential in order to correctly reproduce the behavior of the device under high gate bias. As it is clearly seen (Figure 14), significant current spreading takes place into the buffer layer, thereby influencing the shape of the Id-Vg

characteristics near pinch-off.

Two-dimensional simulation can be seen to be very sensitive to the physical parameters introduced in it as input data, such as the doping profile and the field-velocity curve. The effect of a very small shift on the doping profile can be shown as a definite change in V-1 curves (Figure 15).

Such sensitivity can be a shortcoming whenever experimental data are to be reproduced, since a fair deal of a parameter fitting usually turns out to be needed. In the doping profile, the continuous curve represents the actual profile used in the simulation, which approximates the experimental points.

An example of numerical simulation of an epitaxial small-signal half-micron device is shown. In Figure 17 the layout of the MESFET is shown, the device region actually simulated is reported in Figure 18. The doping profile shape (Figure 19) is obtained from experimental data, and good agreement is found between measurements and simulation (Figure 20). The presence of parasitic resistances within the test fixture is also accounted for.

Another example of simulation concerns a half-micron implanted planar MESFET (Figure 20). The doping profile used in the simulation and the V-1 curves are shown together the measured data (Figure 21).

8. Conclusions

A brief survey has been given on the status of computer aided design techniques as they are used in the development of microwave integrated circuits. Different approaches and still existing basic problems are

outlined; in particular the work on a CAD model library within the framework of the ESPRIT project has been presented.

Fig.1 Steps of the computer-aided design process.

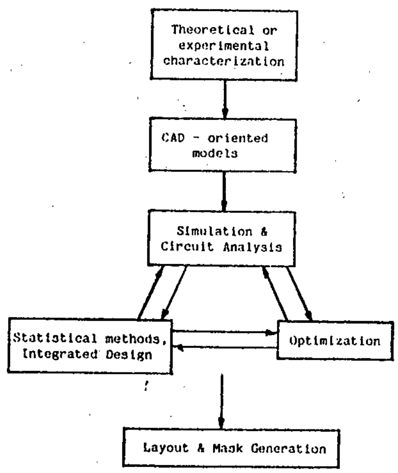


Fig.2 Models for CAD library.

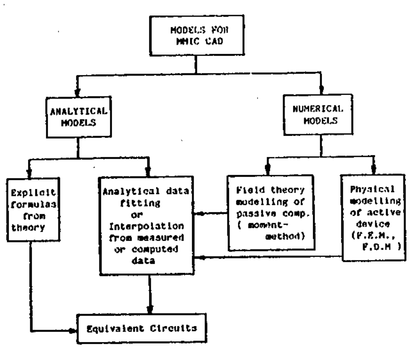


Fig. 3 Models for active and passive elements.

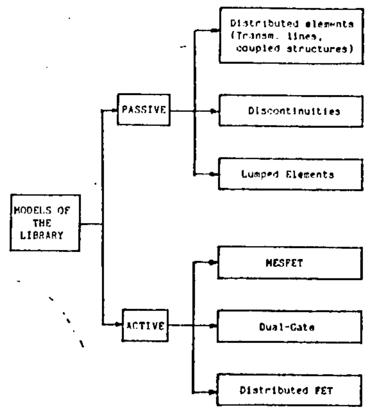


Fig.4 Quasi-TEM lines for microwave integrated circuit applications.

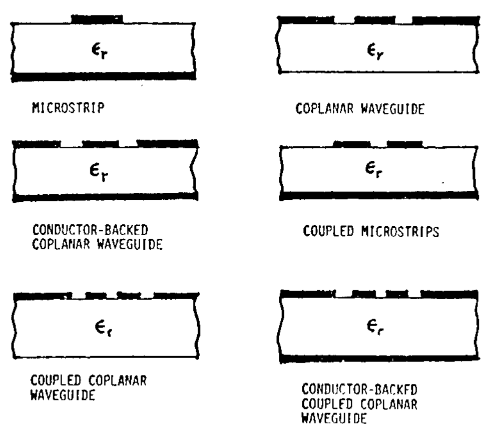


Fig.5 Parameters of coplanar waveguides with finite substrate.

a) Coplanar waveguide with finite substrate

$$Z_{0\,cpw} = \frac{30\pi}{\sqrt{\epsilon_{eff}}}\,\frac{K(k')}{K(k)} \qquad k = a/b$$

$$\epsilon_{eff} = 1 + \frac{\epsilon_r - 1}{2}\,\frac{K(k')\,K(k_1)}{K(k)\,K(k_1')} \qquad k_1 = \sinh(\pi a/2h)/\sinh(\pi b/2h)$$

b) Design chart for coplanar waveguide on GaAs substrate ($\epsilon_r = 13$).

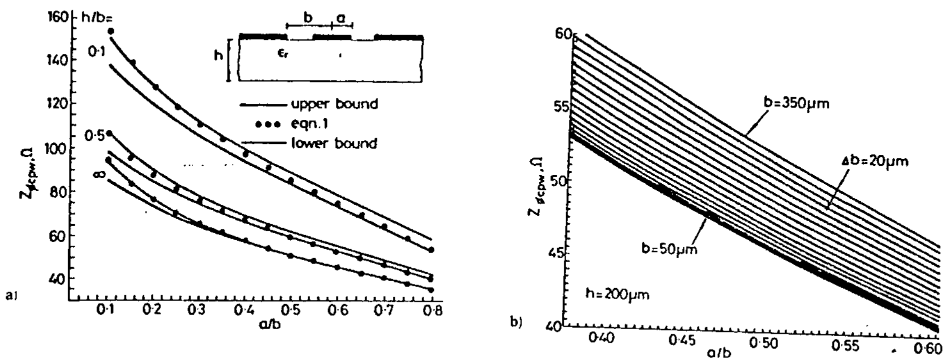
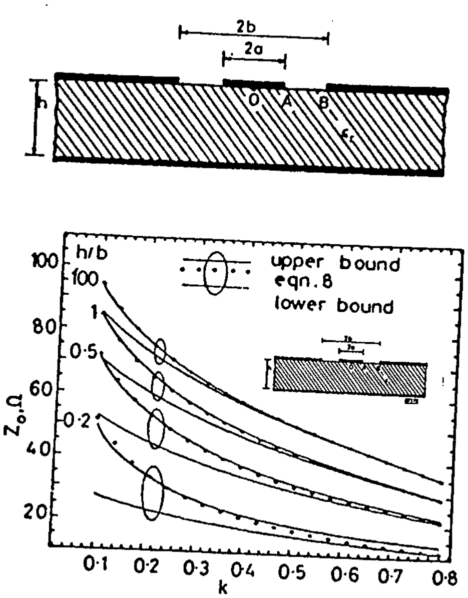


Fig.6 Parameters of coplanar waveguides with lower ground plane.



a) Coplanar waveguide with lower ground plane.

$$Z_0 = \frac{60\pi}{\sqrt{\epsilon_{eff}}}\,\frac{1}{K(k)/K(k') + K(k_1)/K(k_1')} \qquad \epsilon_{eff} = \frac{1 + \epsilon_r \dfrac{K(k')}{K(k)}\,\dfrac{K(k_1)}{K(k_1')}}{1 + \dfrac{K(k')}{K(k)}\,\dfrac{K(k_1)}{K(k_1')}}$$

$$k_1 = \tanh(\pi a/2h)/\tanh(\pi b/2h) \qquad k = a/b$$

b) Characteristic impedance as a function of the shape ratio $k = a/b$, taking the normalised substrate thickness h/b as a parameter (substrate permittivity ($\epsilon_r = 10$).

Fig.7 Microstrip discontinuities
a) Lumped equivalent circuit approach
b) Equivalent waveguide model
c) Full-waveanalysis

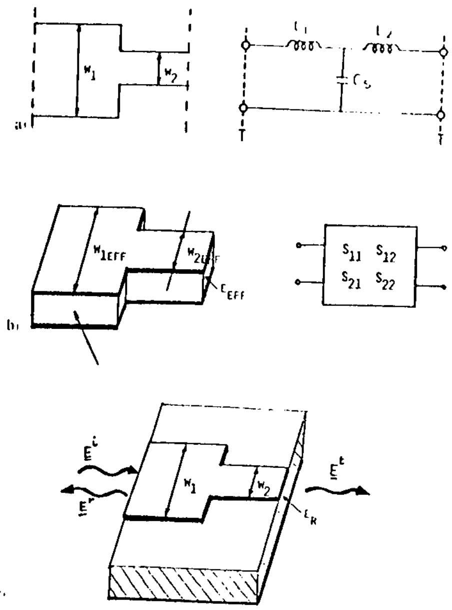
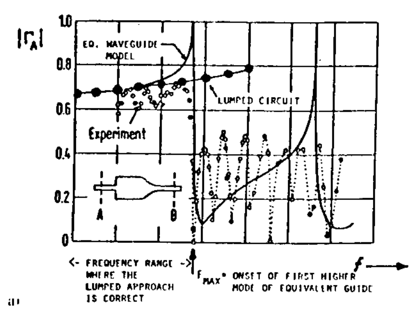


Fig.8 Frequency behaviour of microstrip discontinuities

a) Reflection coefficient of impedance step (from Kompa)
b) $f_{max} \propto 1/W_{EFF}$. (The smaller the line, the higher f_{max}).
Integrated circuits → smaller dimensions → higher f_{max}
→ wider frequency range for quasi-static approach.



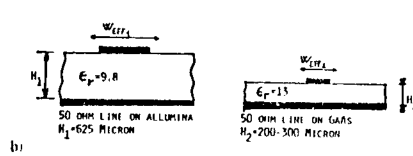


Fig.9 Lumped elements for MMIC

(Mask set 1 for lumped elements scaling investigations; MIM $C = 0.1 - 30\,pF$, Interdig. $C = 0.01 - 0.5\,pF$, Inductors $L = 0.01 - 8\,nH$.

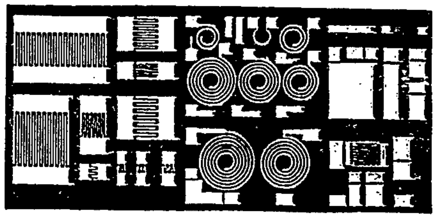


Fig.10 CAD oriented analysis of active components.

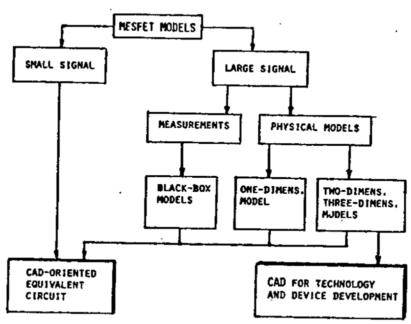


Fig.11 Physical models for divice simulation.

1) BOLTZMANN's EQUATION: (Monte Carlo Model)

$$\frac{\partial f_v}{\partial t} + \mathrm{grad}_k f_v \cdot \frac{d\bar{k}_v}{dt} + \mathrm{grad}_x f_v \cdot \frac{d\bar{x}_v}{dt} = 0$$

2) ENERGY TRANSPORT (TEMPERATURE) MODEL:

- Poisson equation
- Hole and electron continuity equations
- Energy transport equations for holes and electrons
- Hole and electrons momentum transport equations
- Lattice energy balance equations

3) POISSON/CONTINUITY (FIRST ORDER) MODEL:

- Poisson equation

$$\mathrm{div}\,\mathrm{grad}\psi - \frac{q}{\epsilon} \cdot (n - p - C) = 0$$

- Hole continuity equation

$$\mathrm{div}(D_p \cdot \mathrm{grad}p + \mu_p \cdot p \cdot \mathrm{grad}\psi) - R(\psi, n, p) = \frac{\partial p}{\partial t}$$

- Electron continuity equation

$$\mathrm{div}(D_n \cdot \mathrm{grad}n - \mu_n \cdot n \cdot \mathrm{grad}\psi) - R(\psi, n, p) = \frac{\partial n}{\partial t}$$

Fig.12 Device modelling.

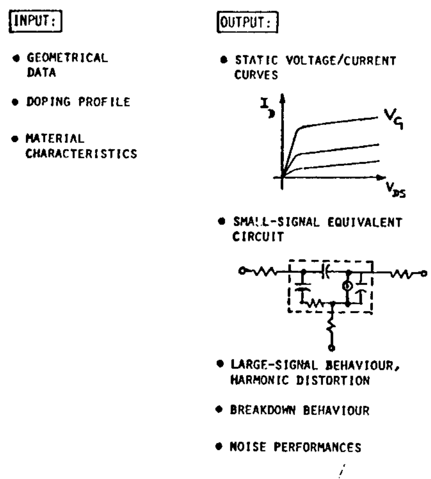


Fig.13 0.5 μm FET with buffer layer

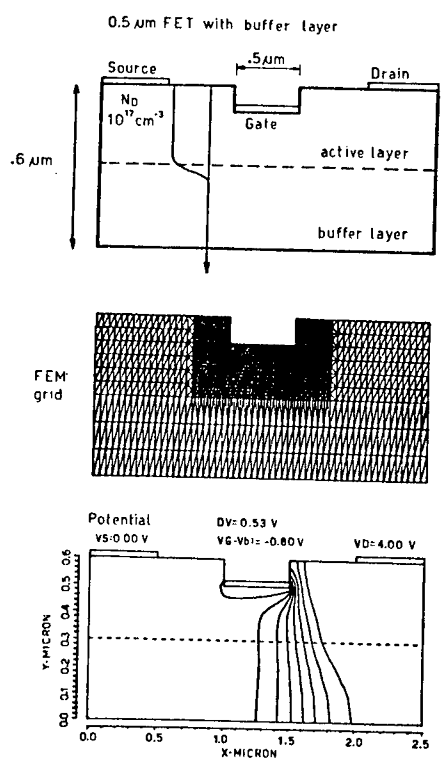


Fig.14 Current spreading into the buffer layer

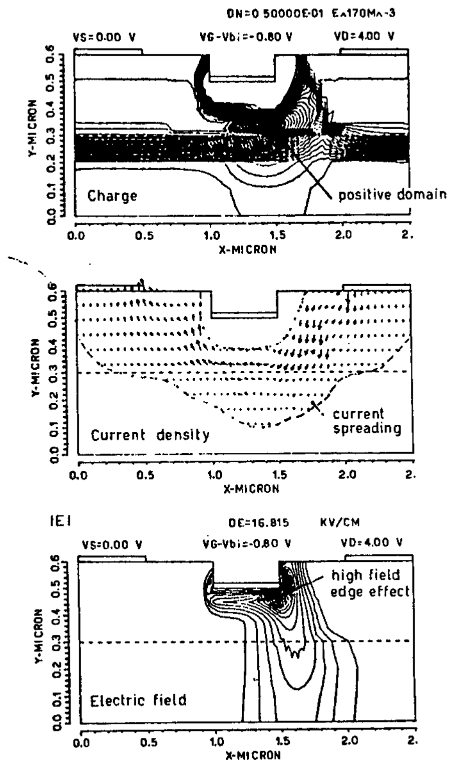


Fig.15 Sensitivity of V-1 curves to doping profile variations.
a)V-1 characteristics
b)Doping profiles

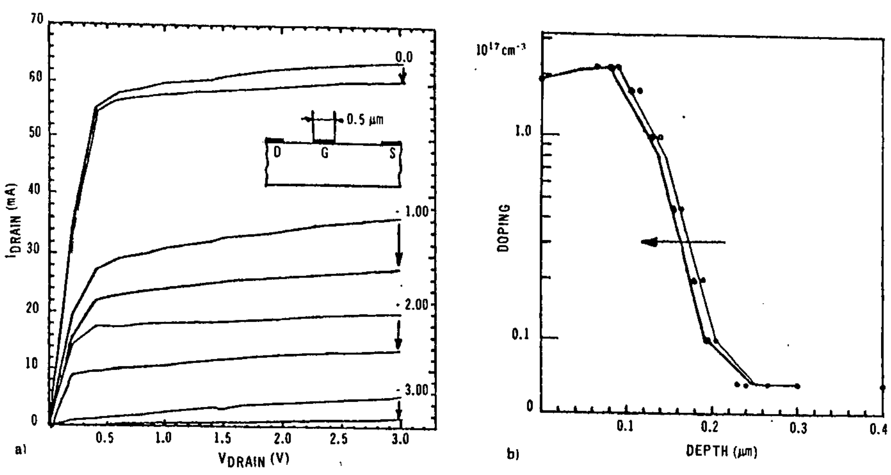


Fig.16 1μ m-gate MESFET: effect of channel pinch off on current distribution (no substrate).

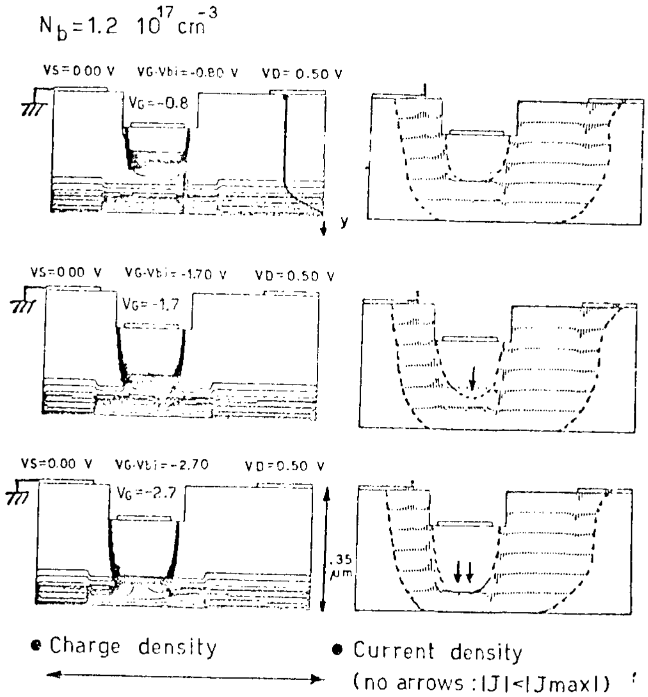


Fig.17 Layout of the MESFET

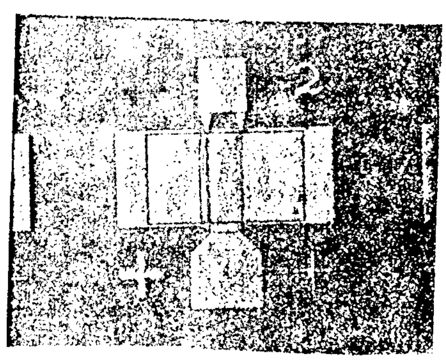


Fig.18 0.5 m-gate epitaxial MESFET (TELETTRA) simulated region.

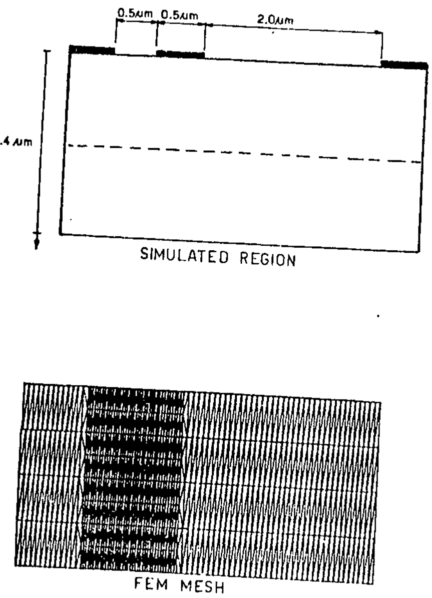


Fig.19 Doping profile.

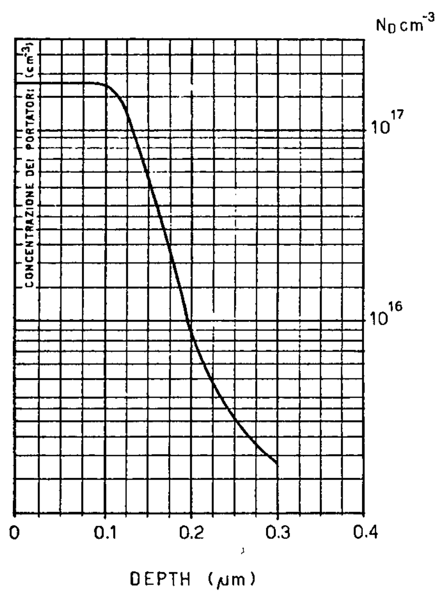


Fig.20 Comparison of simulated results with measured data (0.5 m MESFET,TELETTRA).

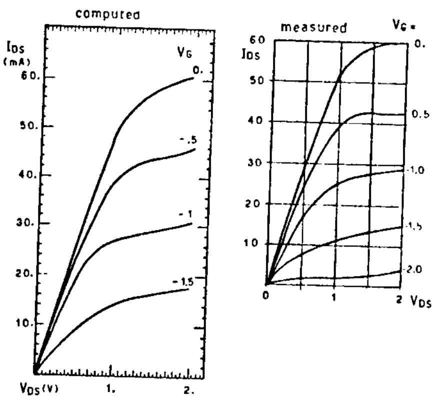


Fig.21 Layout of 0.5 m-gate implanted MESFET (TELETTRA).

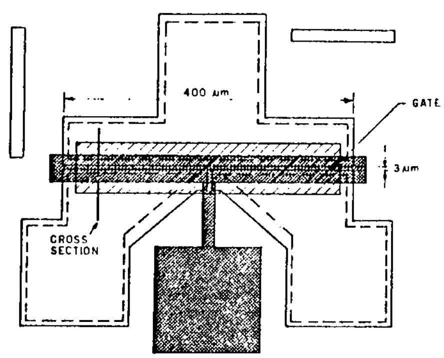
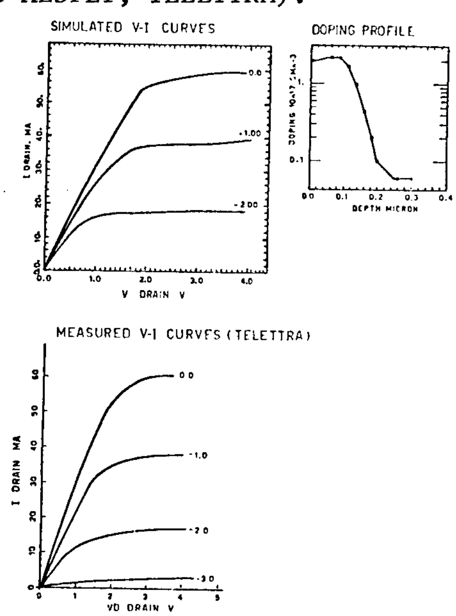


Fig.22 Comparison of simulated results with measured data(0.5 m implanted MESFET, TELETTRA).



WEST EUROPE/MICROELECTRONICS

BRIEFS

TRIPLING OF ESPRIT FUNDS REQUESTED--In order to compete successfully with the Japanese and Americans in the field of information technologies, the European Community Commission has requested a tripling of funds for the forthcoming second phase of the ESPRIT research program. As Karl-Heinz Narjes, vice president of the EC Commission emphasized, industry which has participated in the successful ESPRIT program as well as the member state governments support this increase in funding. For the second phase of ESPRIT, the EC Commission has proposed precompetitive research and development in the following fields: microelectronics and peripherials, data processing systems, as well as application technologies including industrial and office automation. In the second phase, three basic goals, in particular, are pursued: Information and basic technologies will be made available to European industry; thus, its competitiveness will be reinforced. In the context of a more efficient exploitation of resources, industrial cooperation in precompetitive research and development is to be supported. Finally, efforts must focus on the introduction of international standards of European origin. [Text] [Bonn TECHNOLOGIE-NACHRICHTEN MANAGEMENT-INFORMATIONEN in German 28 Aug 86 pp 11-12] 8629/9738

CSO: 3698/M030

COMMENTARY ON EC'S LEGISLATIVE EFFORTS TO ENCOURAGE JOINT R&D

Brussels THE COMMISSION'S BLOCK REGULATION ON RESEARCH AND DEVELOPMENT: A STEP IN THE RIGHT DIRECTION? in English no date given pp 1-23

[Article by Jean-Francois Bellis. The text of this paper is based on a section of the forthcoming book on "EEC Competition Law" by I. Van Bael and J.-F. Bellis to be published by CCH Editions Ltd. in 1987.

[Text] 1. Introduction

In modern economies, industrial competitiveness is increasingly determined by the ability to create new or improved products or services. Cooperation in the field of research and development is often essential to innovation, particularly in high technology sectors where the technical and financial risks are high. Not only does such cooperation enable firms to share these risks, it also allows firms with complementary technologies to avoid costly duplication of efforts and promotes economies of scale.

In its 1968 Notice on Cooperation Agreements, the Commission stated that Article 85(1) does not generally apply to agreements on the joint execution of research work or the joint development of the results of research up to the stage of industrial application nor to the exchange of opinion or experience.[1] The Commission, however, stated that Article 85(1) may be applicable where the parties enter into commitments which restrict their own research and development activity or the utilization of the results of joint work, where certain participants are excluded from the exploitation of the results or where the granting of licences to third parties is expressly or tacitly excluded.[2]

Despite the positive language on "pure" joint and research agreements in the Notice, subsequent decisions have shown that an agreement relating to the joint carrying out of research and development projects may in itself fall under Article 85(1) where the parties are large undertakings and where competition in the field of research is particularly important.[3] In fact, the Commission made it clear in its First Report on Competition Policy that the 1968 Notice should only be taken with "certain reservations" when large firms are involved in a joint research and development agreement.[4] Since the Commission, however, takes a favorable view of cooperation on research and development, joint research and development agreements falling under

Article 85(1) would normally qualify for an exemption under Article 85(3) provided certain conditions are met.

On 19 December 1984, the Commission adopted Regulation No 418/85 granting a block exemption to research and development agreements effective from 1 March 1985 until 31 December 1997.[5] This Regulation is aimed at stimulating technological innovation in Europe, particularly by creating an environment favorable to transnational cooperation among firms which will enable them to compete more effectively on world markets.[6] Although the Commission has generally shown a favorable attitude towards cooperation in research and development, a block exemption Regulation was deemed necessary to create a climate of greater legal certainty for European industry.[7] In this respect, the most noteworthy feature of the Regulation is that it covers agreements which extend beyond research and development to include joint exploitation of results, i.e. joint manufacturing and licensing but not just distribution or selling. In line with the other block exemptions, the Regulation contains a list of clauses that may validly be inserted in an agreement coming within the scope of the exemption (the "white lists" of Articles 4 and 9) and of prohibited clauses which cause the exemption not to apply (the "black list" of Article 6). Like the block exemption for patent licensing and specialization, the Regulation provides for an opposition procedure whereby agreements containing restrictions not expressly exempted or prohibited by the Regulation can be notified to the Commission and are deemed to be exempt unless the Commission opposes exemption within six months.

2. Regulation No 418/85

This section will successively analyze:

1) the prerequisites for the grant of the exemption;

2) the specific restrictions authorized or prohibited by the Regulation;

3) procedural mechanisms instituted by the Regulation (i.e., the opposition procedure and the withdrawal of the exemption).

A. Prerequisites for the grant of the exemption

Regulation No 418/85 basically exempts two types of agreements[8]:

1) agreements for joint[9] research and development[10] coupled or not with agreements for joint exploitation of the results[11]; research and development to include joint exploitation of results, i.e. joint manufacturing and licensing but not joint distribution or selling. In line with the other block exemptions, the Regulation contains a list of clauses that may validly be inserted in an agreement coming within the scope of the exemption (the "white lists) of Articles 4 and 9) and of prohibited clauses which cause the exemption not to apply (the "black list" of Article 6). Like the block exemption for patent licensing and specialization, the Regulation provides for an opposition procedure whereby agreements containing restrictions not expressly exempted or prohibited by the Regulation can be notified to the Commission and are deemed to be exempt unless the Commission opposes exemption within six months.

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A. Prerequisites for the grant of the exemption

Regulation No 418/85 basically exempts two types of agreements[8]:

1) agreements for joint[9] research and development[10] coupled or not with agreements for joint exploitation of the results[11];

2) agreements for joint[12] exploitation[13] of the results of the research and development jointly carried out pursuant to a prior agreement between the same undertakings.

In order to benefit from the exemption, agreements must, in addition, fulfill the following conditions:

1) they must meet the six threshold conditions set forth in Article 2 of the Regulation;

2) the parties to the agreement must meet the market share limitations set forth in Article 3 of the Regulation.

a) Threshold conditions of application

Article 2 of the Regulation sets forth six threshold conditions which must be met in order for the exemption to apply.

The first three conditions apply to all agreements coming within the scope of the Regulation:

1) The research and development program must define the objective of the work and the field in which it is to be carried out.[14] Although this requirement would not seem to raise any particular problem, it should be noted that the defined scope of the program is important insofar as any restriction imposed on the activities of the parties are exempted only within the field covered by the agreement[15];

2) All the parties must have access to the results of the work[16];

3) In the case of agreements limited to joint research and development, each party must remain free to exploit the results of the work as well as any pre-existing technical knowledge necessary for such exploitation independently.[17]

The other three conditions only apply to agreements which extend beyond joint research and development to include joint exploitation:

1) The joint exploitation must relate only to results which are protected by industrial property rights or constitute know-how which "substantially contributes" to technical or economic progress, and the results must be "decisive" for the manufacture of the products or application of processes.[18] The purpose of this requirement is to prevent the parties from entering into a joint production arrangement for products which are not developed pursuant to a joint research and development agreement.[19] In such cases, the parties may only cooperate in production by means of other arrangements such as licensing or specialization, which may benefit from other block exemption Regulations. Apart from the ambiguity inherent in terms such as "substantially contributes" and "decisive," it may prove difficult to determine at the outset whether the joint research and development program will produce patentable results or valuable know-how which is decisive at the manufacturing stage. It is to be hoped that the term "decisive" will receive a liberal interpretation so that the parties will not have to contend with the risk of losing the benefit of the block exemption if the results are not revolutionary.

2) Any joint undertaking or third party charged with the manufacture of the products must supply them only to the parties.[20] This requirement appears to only apply to subcontracting arrangements. If the parties grant a license to a third party for the manufacture of the products, presumably this party could also distribute the products.

3) Undertakings charged with the manufacture of the products by way of specialization must be required to fulfill orders from all the parties.[21] This provision appears designed to ensure that all of the parties may obtain the products for independent distribution on the market.

As can be seen, the latter two threshold conditions are aimed at ensuring that the cooperation does not extend to the distribution stage.

b) Market share limitations

Article 3 of the Regulation contains a set of complex rules governing the availability and duration of the exemption which may be summarized as follows:

1) where the parties are competing manufacturers of products capable of being improved or replaced by those arising out of the joint research and development ("the contract products"), the exemption applies only if their combined production does not exceed 20% of the market for such products in the common market or a substantial part thereof;

2) where the parties are not competing manufacturers of products capable of being improved or replaced by the contract products, the exemption applies regardless of their market shares;

3) in both cases, after five years of exploitation, the exemption will only continue to apply as long as the parties' combined production of the new

product, or other products considered by users to be equivalent in view of their characteristics, price and intended use, does not exceed 20% of the total market.[22]

These rules reflect the Commission's long-standing suspicion on research and development agreements entered into by large firms competing on the same market[23] as well as its desire to ensure that several independent poles of research remain in the Community.[24]

At the time when the agreement is concluded, only actual competitors appear to be subject to the market share limitation. This represents a significant departure from the approach generally adopted by the Commission in the past where the focus has been on potential competition as well as actual competition[25]. In fact, the draft Regulation referred to potential competition, but this language was deleted because it would have proven difficult to apply in practice.[26]

In applying these rules relating to the market share limitation, the critical inquiry concerns the delimitation of the relevant product market. The Regulation defines this market as that for "products capable of being improved or replaced" by those arising out of the joint research and development. This definition poses numerous problems. It assumes that the parties are able to accurately predict at the outset the nature of the products which will result from the project as well as their field of application. Such predictions may prove to be difficult in cases where the project involves a substantial amount of basic research at the outset, which is arguably the type of project most likely to generate significant long-term tecnological benefits.

Even if it is possible to clearly identify the products which will result from the cooperation in research and development, the parties are still exposed to a high degree of uncertainty. In many cases, the determination of the boundaries of the relevant product market will give rise to complex issues relating to the substitutability of products. Indeed, only the case of a truly novel product such as a miracle drug will the parties be able to determine with certainty that the exemption is applicable to their agreement since, by definition, the product would not improve or replace existing products. In such a case, however, it is likely that the agreement will no longer qualify for the exemption after the initial five-year period since the parties will probably control the entire market or at least a substantial portion of the market for the product. Moreover, there is a risk that the exemption may be withdrawn even earlier as the Regulation provides that the Commission may withdraw the exemption where "the contract products are not subject in the whole or a substantial part of the common market to effective competition from identical products or products considered by users to be equivalent in view of their characteristics, price and intended uses."[27]

In summary, the most critical feature of the entire Regulation--the market share limitation--is also the most nebulous, thus heightening the already significant risk factor generally attached to research and development projects. Apart from undermining the goal of legal certainty, this limitation also appears inconsistent with the goal of stimulating technological innovation in Europe.

Specifically, the market share threshold severely limits the usefulness of the Regulation for large European firms in direct competition with Japanese and U.S. multinationals on worldwide markets.

B. Opecific restrictions covered by the regulation

Articles 4, 5 and 6 of the Regulation contain lists of clauses which are specifically allowed or prohibited. Article 4(1) contains a list of restrictions normally falling under Article 85(1) but benefitting from the exemption. Article 5(1) contains a list of provisions which normally should not fall under Article 85(1). Article 6 contains a list of restrictions which are blacklisted as being inconsistent with the exemption. Articles 4(2) and 5(2) make it clear that they apply to obligations with a more limited scope than those set out in respectively Articles 4(1) and 5(1).

The obligations referred to in these three lists fall into the following main categories:

1) Independent research and development;

2) territorial restrictions;

3) exclusive purchasing;

4) intellectual property rights.

Apart from these four broad categories, the Regulation deals with other clauses which will be vriefly reviewed below.

a) Independent research and development

Restrictions imposed on the parties concerning independent research and development in the same field or a closely connected field generally fall under Article 85(1) since they restrict competition between the parties in the field of research and prevent each from gaining a competitive edge over the other. However, such restrictions, including those concerning cooperation with third parties, are exempted by the Regulation as they ensure that the parties will devote their efforts to the project.[28] Accordingly, Article 4(1)(a) and (b) exempt obligations not to carry out independently or to enter into agreements with third parties on research and development in the field to which the programme relates or in a "closely connected" field during the execution of the programme.

Restrictions on independent research and development must not be unduly broad as the exemption does not apply to those extending to "unconnected" fields. In practice, it may prove difficult to distinguish between "closely connected" fields and "unconnected" fields. It would seem that if work carried out independently could be used in the joint program, such work relates to a "closely connected" field.

After the joint research and development program has been completed, no restrictions may be imposed on the parties regarding independent activity.[29] However,

an obligation may be imposed on the parties to grant each other non-exclusive licenses for inventions relating to improvements or new applications which are developed independently after the completion of the program.[30]

b) Territorial restrictions

The Regulation exempts certain territorial restrictions concerning both the manufacture and distribution of the products arising out of the joint research and development. As in other areas such as patent licensing and exclusive distribution, such restrictions may be justified on the ground that they enable firms to concentrate their efforts in a given area, thus facilitating the introduction and promotion of the product on the market. This reasoning would seem particularly cogent in the context of joint research and development programs, which often give rise to entirely new products unfamiliar to consumers.

The Regulation exempts the following two types of territorial restrictions:

1) As regards manufacturing, the parties may be required not to manufacture the contract products or apply the contract processes in territories reserved for other parties.[31] Manufacturing exclusivity is generally considered to have a minimal effect on competition, giving rise to problems only when transportation costs are high enough to generate what may amount to de facto sales exclusivity.

2) As regards distribution arrangements, the Regulation follows the classic approach adopted by the Commission with respect to territorial restrictions imposed in connection with distribution arrangements by exempting restrictions on active sales while preserving the possibility of passive sales.[32] However, the Regulation exempts a ban on active sales only for a five-year period from the time the contract products are first put on the market within the common market, a limitation not found in other areas such as patent licensing and exclusive distribution. Presumably, this temporal limitation was deemed necessary due to the strong horizontal element often present in joint research and development programs even though the market share limitation would seem to constitute an effective deterrent to unacceptable restrictions on competition flowing from cooperation between competing manufacturers.

c) Exclusive purchasing

Article 4(1)(c) of the Regulation exempts exclusive purchasing obligations to obtain the products only from the parties, joint organizations or third parties charged with their manufacture, thus giving the manufacture a guaranteed outlet which enables him to achieve rationalization of production. In contrast to the exclusive purchasing group exemption, the Regulation does not allow clauses preventing the purchaser from buying competing products, again emphasizing that the Regulation is concerned with research, development and manufacturing and largely prohibits restrictions which may affect competition at the distribution stage.

As a corollary to the exclusive purchasing obligation, the parties may be required to supply other parties with minimum quantities of the products.[33]

d) Intellectual property rights

The Regulation No 418/85 exempts a number of obligations common to agreements involving intellectual property rights and know-how and which are discussed in detail in the chapter on patent licensing.[34] However, there are several clauses specific to joint research and development programs which deserve brief mention.

Although the Regulation reflects the Commission's hostility toward no-challenge clauses, there is not an absolute ban on these clauses as is the case in the patent licensing block exemption. Instead, the ban on no-challenge clauses is more nuanced. If the intellectual property rights existed prior to the joint research and development program, only no-challenge clauses extending beyond the stage of research and development are prohibited. In the case ofintellectual property rights which protect the results of the joint research and development, no-challenge clauses are prohibited if they extend beyond the expiry of the agreement.[35] Thus, the Regulation seeks to strike a balance between the anti-competitive effects of no-challenge clauses and the need to allow firms to carry out joint research and development projects in an atmosphere of cooperation. It is important to note that the Regulation does not explicitly exempt no-challenge clauses for pre-existing intellectual property rights during the research and development program nor those for intellectual property rights protecting the results of the joint work before the expiry of the agreement, so it would appear necessary to notify such clauses to the Commission under the opposition procedure in order to obtain an exemption.

The Regulation also exempts an obligation to pay royalities or render services to other parties to compensate for unequal contributions to the research and development program or unequal exploitation of its results.[36]

C. Miscellaneous clauses

In line with other block exemptions, especially the patent licensing block exemption, Article 6 of the Regulation blacklists, inter alia:

1) maximum quantity restrictions;[37]

2) price restrictions;[38]

3) customer restrictions;[39]

4) prohibition on third parties manufacturing the contract products or applying the contract processes in the absence of joint manufacture;[40]

5) obligations to refuse without any objectively justified reason to meet demand from users or dealers established in their respective territories who would market the contract products in other territories of the common market

or to make it difficult for users or dealers to obtain the contract products from other dealers in the common market.[41]

Other clauses not previously discussed in the text or the notes of this section that are specifically discussed in the Regulation are the obligation to communicate necessary technical knowledge[42] or not to use any know-how received from another party for purposes other than carrying out the arrangement.[43] Not unexpectedly, these two clauses are included in the list of provisions normally not coming within Article 85(1).

D. Procedural mechanisms

This section will deal with the following two procedural mechanisms:

1) the opposition procedure;

2) the withdrawal of the exemption.

a) Opposition Procedure

Like the block exemptions for patent licensing agreements and specialization agreements, the Regulation provides for a fast-track "opposition" procedure for agreements containing restrictive clauses which are neither expressly permitted nor expressly prohibited by the Regulation. Article 7 stipulates that such an agreement may benefit from the exemption provided that:

1) the agreement is notified to the Commission with complete and accurate information and express reference is made to Article 7 in the notification or in a communication accompanying it; and

2) the Commission does not oppose such exemption within a period of six months.[44]

The Commission must oppose the exemption if it receives a request to do so from a Member State within three months of the forwarding to the Member State of the notification or communication.[45] Unless the Member State withdraws its request, the Commission may only withdraw its opposition after consultation of the Advisory Committee on Restrictive Practices and Dominant Positions.[46] In all other cases, the Commission may withdraw its opposition at any time.

The exemption normally applies from the date of notification unless the agreement has to be amended to meet the conditions of Article 85(3), in which case the exemption applies from the date of the amendment.[47]

b) Withdrawal of the exemption

Article 10 provides that the Commission may withdraw the benefit of the exemption where it finds in a particular case that an agreement exempted by the Regulation nevertheless has certain effects which are incompatible with the conditions laid down in Article 85(3), particularly where:

(1) the existence of the agreement substantially restricts the scope for third parties to carry out research and development in the relevant field because of the limited research capacity available elsewhere;

(2) because of the particular structure of supply, the existence of the agreement substantially restricts the access of third parties to the market for the contract products;

(3) without any objectively valid reason, the parties do not exploit the results of the joint research and development; or

(4) the contract products are not subject in the whole or a substantial part of the common market to effective competition from identical products or products considered by users as equivalent in view of their characteristics, price and intended use.

Conclusion

The block exemption regulation on research and development agreements undoubtedly constitutes a step in the right direction in that it reflects a generally positive attitude toward cooperation. As jointed out above, however, the objective of providing more certainty is not fully achieved due to:

--the existence of a market share criterion with all the attending difficulties of defining the relevant product market;

--the numerous conditions with a largely subjective content (such as the concepts of "substantially contributes" or "decisive," etc.) set out in the Regulation.

Finally, it is important to note that the exemption is limited to joint research and production but does not extend to joint distribution.

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FOOTNOTES

1. Notice on agreements, decisions and concerted practices in the field of cooperation, J. O. (1968) C 75/3, corrigendum J. O. (1968) C 84/14 (hereinafter cited as "1968 Notice"), at paras. 28-31.

2. Henkel/Colgate, J. O. (1972) L 14/14; ; Beecham/Parke Davis, O. J. (1979) L 70/11.

3. First Report on Competition Policy, No 32.

4. Commission Regulation No 418/85 on the application of Article 85(3) of the Treaty to categories of research and development agreements, O. J. (1985) L 53/5, Annex 18 hereto. The Regulation contains provisions dealing with "old" agreements or agreements dispensed from notification. See Art. 11.

5. Commission Press Release of 20 December 1984, IP(84) 471 (hereinafter cited as "Press Release"). See also Fourteenth Report on Competition Policy, No 28.

6. Commission Press Release of 20 December 1984, IP(84) 471 (hereinafter cited as "Press Release"). See also Fourteenth Report on Competition Policy, No 28.

7. Reg. No 418/85, Art. 1(1).

8. It is important to note that research and development as well as exploitations of results are deemed to be "joint" not only when the parties actually carry out the work together, but also when they entrust the work of a third party, perform the work under a specialization arrangement or collaborate in licensing industrial property rights or know-how to entitle other parties to carry out the work. Reg. No 418/85, Art. 1(3).

9. Research and development is defined in Article 1(2)(a) as "the acquisition of technical knowledge and the carrying out of theoretical analysis, systematic study or experimentation, including experimental production, technical testing of products or processes, the establishment of the necessary facilities and the obtaining of intellectual property rights for the results."

10. Provisions of the Regulation which only apply to agreements extending to joint exploitation include those dealing with exclusive purchasing and supply, quantities, prices, and field of use and customer restrictions.

11. It is important to note that research and development as well as exploitations of results are deemed to be "joint" not only when the parties actually carry out the work together, but also when they entrust the work to a third party, perform the work under a specialization arrangement or collaborate in licensing industrial property rights or know-how to entitle other parties to carry out the work. Reg. No 418/85, Art. 1(3).

12. Exploitation of the results is defined in Article 1(2)(d) as "the manufacture of the contract processes or the assignment or licensing of intellectual property rights or the communication of know-how required for such manufacture or application."

13. Reg. No 418/85, Art. 2(a).

14. See text accompanying Nos. 73-75, infra.

15. Reg. No 418/85, Art. 2(a).

16. Ibid, Art. 2(d).

17. Id.

18. Ibid. Recit. 7.

19. Ibid., Art. 2(e).

20. Ibid., Art. 2(f).

21. Ibid., Art. 3. The exemption will continue to apply where the market share in question does not exceed 22% during any period of two consecutive financial years, Art. 3(4). If this 22% threshold is exceeded, the exemption will continue to apply for a period of six months following the end of the financial year during which it was exceeded, Art. 3(5).

22. See Henkel/Colage, N 2 supra; Notice, N 1 supra. If a joint R&D agreement is entered into by competing manufacturers with a combined market share in excess of 20%, the parties must apply for an individual exemption; the opposition procedure is not available for this purpose. As stated in Recital 10, the decision will take account of world competition and the particular circumstances prevailing in the manufacture of high technology products.

23. Reg. No 418/85, Recit. 8.

24. See, e.g., Vacuum Interrupters I, O. J. (1977) L 48/32. Under the principles set forth in the Thirteenth Report on Competition Policy, it would seem doubtful that a restriction of potential competition would be found in such an extreme case.

25. Under the draft text, the exemption was only available if not more than one of the three "actually or potentially" leading undertakings in the sector concerned was a party to the agreement, Draft Regulation on the application of Article 85(3) of the Treaty to categories of research and development cooperation agreements, O. J. (1984) C 16/3.

26. Reg. No 418/85, Art. 10(d).

27. Ibid., Art. 4(1)(a)-(b). Restrictions on independent research activity in unconnected fields are blacklisted in Article 6(a).

28. Ibid., Art. 6(a).

29. Ibid., Art. 6(g).

30. Ibid., Art. 4(1)(d).

31. Ibid., Art. 4(1)(g). Any territorial restrictions on sales activities not expressly exempted in Article 4(1)(d) are blacklisted in Article 6(f).

32. Ibid., Art. 5(1)(h).

33. See, ibid.: Article 4(1)(a) exempting field of use restrictions except where two or more of the parties are competitors within the meaning of Article 3 at the time the agreement was entered into;

Article 5(1)(c) relating to obligations to maintain in force intellectual property rights for the contract processes or products;

Article 5(1)(d) relating to obligations to preserve the confidentiality of know-how;

Article 5(1)(3) relating to obligations to assist in the production of intellectual property rights.

See also Article 5(1)(g) providing that no restriction of competition is involved in an obligation to share royalties received from third parties with other parties.

34. Ibid., Art. 6(b).

35. Ibid., Art. 5(1)(g).

36. Ibid., Art. 6(c).

37. Ibid., Art. 6(d).

38. Ibid., Art. 6(3).

39. Ibid., Art. 6(g).

40. Ibid., Art. 6(h). See also Art. 6(f).

41. Ibid., Art. 5(1)(a).

42. Ibid., Art. 5(1)(b).

43. Ibid., Art. 7(1). The six-month period starts running from the date of receipt of the notification by the Commission or in cases of notifications made by registered post, the date shown on the postmark of the place of posting, Art. 7(2).

44. Ibid., Art. 7(5).

45. Ibid., Art. 7(6).

46. Ibid., Art. 7(7) and (8).

47. On the benefits of specialization agreements, see First Report on Competition Policy, No 27.

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EC POLICY ON TRANSFER OF KNOW-HOW WITHIN EUROPE

Brussels EC COMMISSION DISCUSSION DOCUMENT 86/EM-1 in English no date given pp 1-19

[Text] The treatment of know-how licensing under the competition rules

1. Importance of know-how transfer in the context of the Community's policies in the technological field

The transfer of know-how is an important complement to all the community's policies in the technological field (e.g. ESPIRT, RACE, BRITE). These policies are based on the need to improve substantially cross-frontier transfers of technology within Europe by means of research and development cooperation and the sbusequent dissemination of the results through patent and know-how licences to other Community companies and sectors. The development of European-sourced technology from the Community's vast technological potential will also help to reduce technological dependency on third countries.

It should be borne in mind that the transfer of technology, irrespective of whether or not it is protected by patents, is a highly complex process of assimilation and adaptation of know-how which requires close mutual understanding between the companies involved. These characteristics peculiar to know-how transfer have to be taken into account when assessing the agreements in question under Article 85.

Competition stimulates the innovative capacity of Community industry. On the other hand, competition policy should facilitate cooperation aimed at the development and dissemination of new technologies, to the extent that this opens up new markets, creates new competitors and products and thus strengthens competition. For this purpose, it is indispensable to define which forms of contractual arrangements are compatible with the competition rules, so as to provide the necessary legal certainty.

The Commission has already shown a favourable attitude to technology transfer in the Research and Development and Patent Licensing Regulations.

2. Definition of know-how

The term know-how is generally employed in business to denote any knowledge relating to the use of a method of manufacture or to the use or application of

an industrial process, or any experience in technical, commercial, administrative, financial or other sectors that is applied in business practice. Council Regulation 19/65 refers in less broad terms to "a method of manufacture or knowledge relating to the use or to the application of industrial processes." This document however is concerned with industrial know-how which, for the purpose of discussion, may broadly be described as substantial technological information relating to the whole or a part of a manufacturing process or a product, or to the development thereof, which is not in the public domain, and therefore justifies efforts to maintain its secrecy and which is valuable to the prospective licensee.

The term "substantial" is intended to exclude information that is trivial or obvious. The notion "not in the public domain" does not mean that the know-how must be totally unobtainable. It may even be the case that each individual component of the know-how package is known to qualified engineers in the sector but that the precise configuration and assembly of components and features which make the technology work is not readily available. The notion "efforts to maintain its secrecy" means that the know-how possessor must take steps which are reasonable under the circumstances to ensure that this knowledge does not become generally known to the public. The term "valuable" is taken to mean that the know-how is of decisive importance to the licensee in starting up production rapidly using a working technology for which he is therefore willing to pay royalties.

Know-how which relates not to technology as such but to other matters indispensable to the proper exploitation of the technology may in this context be treated in the same way. For example, it may be necessary in certain circumstances to provide the licensee with essential information concerning the characteristics of raw materials, the storage and conservation of the final product, etc.

Pure marketing know-how and know-how communicated under subcontracts or commercial franchising arrangements should be excluded from the scope of a regulation or guidelines. Know-how licences connected with other agreements or practices between the contracting parties such as research and development cooperation, joint ventures, patent pools and other cross-licensing arrangements should also be outside the scope of such an instrument. Any regulation should apply to simple one-way agreements, covering all or a part of the common market, whether exclusive or not, which disclose the know-how to the other party for use in production; agreements regarding selling alone would be excluded, except in cases where the licensor undertakes to supply the contract products to the licensee for a preliminary period before the licensee himself commences production.

3. Need for comparable treatment of patent licenses and know-how agreements under the competition rules

The patent system is generally recognised as being the best legal means available for the promotion of technical progress in the public interest. Given the stringent requirements of the patent system itself (public disclosure and examination of patentability) it can generally be assumed that a patent involves technical knowledge of an objectively high quality. In contrast to

patents, know-how may involve elements which are not worthy of patent protection, its novelty and substantial value have not been tested by a public authority and there is a danger that cartel-minded firms could make irrelevant technical data the subject of spurious know-how licences, their main objective being to obtain official approval for disguised market-sharing agreements and other restrictive practices.

However, whether there is real substance or subterfuge in know-how licence restraints can be ascertained by requiring that, to comply with competition rules, the know-how granted must satisfy sufficiently high standards. Both parents and substantial, not publicly know and valuable know-how are, notwithstanding their substantial differences of legal status, essential factors in technological progress and competitivity and both know-how agreements and patent licences should enjoy comparable favourable treatment under the competition rules. This is apparent from the following:

a) Know-how can, and often does, have an economic value equal to or greater than that of patents; its development and exploitation on an industrial scale can be extremely costly and complicated.

The large sums spent by industry on research and development are not necessarily directed at or likely to lead to patentable inventions. Research and development effort is mostly directed at problem-solving, and examples from several industrial sectors suggest that only about a quarter of research and development results end up in patent applications. Non-patented results can be a major determinant of firms' competitive advantage. With the pace of technological change, the possession of or immediate access to the latest technology is the key to success in the market. This is especially the case in high-technology sectors.

b) In line with its imporatnce as a determinant of competitive advantage, know-how plays an indispensable role in technology licensing. This applies not only to pure know-how agreements, which generally account for a third of all licensing agreements, but also to mixed agreements in which a patent licence is granted along with the transfer of know-how. In practice, the boundary between the two types of agreements is fluid: This is for example the case where a patent licensed with the know-how has only been applied for at the time of licensing and is subsequently not granted, or where the licensed patent expires, is declared invalid or is lost for any other reason while the transfer of the know-how continues. Such conversions of mixed into pure know-how agreements are not uncommon.

These considerations alone make it clear that a generally less favourable treatment of know-how than patent licences under the competition rules would be unjustified and would lead to unwarranted distinctions between different constitutive elements of a given technology being licensed.

Indeed, there are consideration that could arguably support a less restrictive approach under the competition rules to know-how than to patent licences. On the one hand, whereas patented technology is, by definition, fully disclosed and subject to compulsory licences, in the event of inadequate

exploitation, and to unlimited use once the patent expires, know-how may be hoarded for ever from the public unless its possessor is willing to license. Whilst the hoarding of know-how may only occur infrequently, the danger of hoarding makes it in the public interest to have a positive climate for know-how licences. Furthermore, whereas secret know-how does not have the beneficial effects of publication as in the case of patents, the absence of patent protection minimizes the effect of restrictive clauses in know-how licences, as the know-how possessor has no absolute right to exclude third parties from independelty discovering and exploiting the same technology and has to rely only on secrecy.

In the light of the above consideration, this paper suggests that contractual restrictions on competition between licensors and licensess /and between licensees inter se/ in know-how licences, in particular territorial restrictions, should be approached in the same way as in patent licences under the Patent Licensing regulation, due regard being had to their particular features. The reasons, relating to the protection of investment and the wider dissemination of technology, for allowing varying degrees of territorial protection as between the licensor and the licensee /and as between licensees inter se/ that have been acknowledged in the Patent Licensing Regulation do not become less valid only because the know-how possessor enjoys less extensive legal protection than the patent-holder.

It is most important in this context that know-how can be protected only by contract when licensed. A prohibition of indispensable contractual provisions in know-how licences could impede on inhibit the license of know-how.

4. Response of policy to economic realities

The Commission considers that such an approach would respond to the following competitive purposes and objective needs of industry without coming into conflict with the general aims of the patent system:

--From the competition policy point of view, the license of know-how has a direct pro-competitive effect: a know-how licence creates new or increased competition because with the licensed technology the licensee is able to market a product which competes with existing comparable products even in the areas of non-patentable improvements. An indirect pro-competitive effect will also come about, as after the expiration of any temporary contractual limitations, competition between licensor, licensee and other licensees will occur. The know-how licence may also increase the number of production facilities and the quantity of goods produced in the common market. Furthermore, it facilitiates the penetration of new markets, since the licensing of a firm in another country offers an attractive middle ground between exporting and the risks of direct foreign investment and marketing. In particular, licensing may help to overcome problems related to non-tariff barriers and national public procurement policies. Also, know-how licensing usually leads to an even greater transfer or exchange of technology, as the licensee mostly receives a complete package of the licensor's knowledge.

--A licensor transferring his technology creates a competitor capable of producing identical products of the same quality and technological standard.

In economic reality therefore, a company cannot be expected to act against its own business interests by granting a know-how licence without providing for reasonable protection from competition by the licensee in its own market. For his part, the licensee will normally only agree to take the licence and to undertake the necessary investment if reasonable protection from the licensor /and other licensees/ is provided for in the contract.

Provisions for such protection only relate to the use of the licenses technology or the products made from such technology. Thus, they do not impose restraints in existing markets but only limit the competition created by the licence.

--Allowing the possessors of know-how to protect their legitimate business interests within reasonable limits should not substantially influence the propensity of companies to make their inventions public by applying for patents.

Developers of a patentable invention may in particular cases have serious reasons for not applying for patents, for example when the life cycle of the technology concerned is so short that it is not appropriate to seek protection for every technological development or when they might not have the financial means at their disposal or might not wish to obtain and maintain patent protection in every Member State. In these cases the decision not to obtain patent protection does not mean that the processor of know-how is seeking to circumvent the patent laws. However, given a straight choice between statutory protection and the very fragile protection afforded to know-how, which is vulnerable to outside discovery and publication, they might continue to seek patent coverage.

5. Provisions frequently contained in know-how licensing agreements

The following analysis deals with the contractual clauses usually included in know-how agreements. The Commission should state how it would assess these clauses in relation to Article 85.

Some of these clauses will not normally fall under Article 85(1); others may fall under Article 85(1) but may be exempted under Article 85(3) in individual decisions or by a future block exemption regulation, in so far and as long as the know-how has not entered into the public domain. If a block exemption regulation were adopted, its structure could follow closely the Patent Licensing Regulation in giving a list of obligations normally caught by Article 85(1) which would be exempted by the Regulation, a list setting forth these obligations not mormally deemed to involve restrictions of competition, and a "blacklist" of provisions or restrictions whose presence will make the exemption unavilable. An opposition procedure could also be provided for.

6. Obligations which are normally considered not to fall under Article 85(1)

i) Obligation to preserve secrecy

All obligations imposed on the Licensee to take any steps necessary to protect the know-how from losing its secrecy can be regarded as inherent in the transfer

and thus not falling under Article 85. The obligation not to divulge the know-how can also be extended beyond the expiry of the agreement as long as the know-how has not entered the public domain.

ii) Obligations not to sub-license

Obligations on the licensee not to grant sub-licences without the consent of the licensor are related to the secrecy obligation. They are justified in the context of the licensee's obligation to preserve the possession and the secrecy of the licensed know-how. This obligation can also be extended beyond the term of the licence as long as the know-how has not entered the public domain.

iii) Obligations relating to improvements in the know-how

Arrangements for the reciprocal non-exclusive communication of improvements between licensor and licensee (non-exclusive grant-back), on a royalty-free basis or otherwise, are generally not restrictive of competition. The relevant question in this context is the extent to which the licensee can freely exploit his own improvements of the know-how initially transferred.

Firstly, it should be provided that the licensee may not be prevented from using them, /at least during the validity of the contract/ or from licensing them to third parties as long as such licensing does not disclose the original know-how of the licensor that is still secret.

Secondly, the question whether the licensee must also be free to sub-license to third parties the original know-how where that know-how is indispensable for the exploitation of the licencee's own improvements may give rise to difficult issues.

Different interests are involved here: from the public interest standpoint it appears desirable to secure the largest possible dissemination of any new ideas, including improvements by the licensee. On the other hand, the fact cannot be ignored that such sub-licensing to possibly a large number of third parties poses a much greater danger that the secrets become known and the licensor loses everything. To refuse the licensor the right to prevent such sub-licensing would constitute a major exception to the permissibility of obligations designed to preserve the confidentiality of received know-how. As, but for the licence, the licensee would not have the confidential know-how to build upon in future development activities, it is therefore suggested that such refusal is not justified. Furthermore, it is likely that no substantial hindrance to subsequent transfers of technology will result from allowing the former licensor discretion over sub-licensing, for a licensee who has developed improvements will be in a strong bargaining position to obtain the licensor's consent for sub-licensing. Not only will such sub-licensing increase the flow of royalties to the licensor, but the licensee may be able to obtain the licensor's consent for sub-licensing in return for a grant-back of substantial improvements which will enable the licensor to exploit the very latest technology.

iv) Obligations concerning quality standards and specifications

Obligations imposed on the licensee to meet certain minimum specifications and quality standards in the production of the licensed products should not be regarded as restrictive of competition provided that they serve to maintain the technological and quality image of the licensor. This will onoy be the case when the product bears the licensor's trade mark or identifies the licensor in some other way.

v) Royalties

In principle, the contracting parties should be left free to negotiate the level of royalties and initial down-payments and the distribution of royalties over time. Normally the licensor will be interested in receiving high initial lump sums and royalties during the first few years of the licence. The licensee, on the other hand, will be interested in minimizing initial costs until production and marketing of the licensed product have reached full scale. As a compromise between these two positions, arrangements designed to spread payments of a fixed sum over a given period which may even extend beyond the entry of the know-how into the public comain are in the nature of an installment plan and therefore need not be considered restrictive of competition.

One of the more controversial aspects of know-how licensing, however, is whether a licensee can be forced to pay royalties in the form of percentages of turnover after the technology has become public knowledge and is being used royalty-free by competitors. It is clear that in a patent license royalties cannot be charged after expiry of the patent &unless by payment in installments over time). In a mixed patent and know-how agreement there may be a danger that the know-how is simply used as a pretext to require royalties on the expired patents, in which case payment of royalties cannot legitimately be required. However, in pure know-how licences there would be no improper extension of a legal monopoly and the fact that the know-how had become public should not in itself be governed by the rule on patents, i.e. the prevention of continuation of the licensee's obligation to pay royalties.

The following solutions appear possible: firstly, the parties cna agree that entry into the public domain terminates the licence or otherwise eliminates the necessity to pay royalties. Secondly, where the parties have not so agreed, it could be envisaged that an obligation on the licensee to keep paying royalties until the end of the contract should not be considered restrictive of competition, if parties have agreed a reasonably limited duration with the option at the end of the contract either to renew the licence, should the technology still be secret, or to continue to use the licensee technology on a royalty-free basis should it no longer be secret. The same should apply if, irrespective of the duration of the agreement, parties agree that payments are still due for a limited period after the entry of the technology into the public domain. Such a period should generally not exceed three years as an obligation to keep on paying for a larger or indefinite period would ultimately place the licensee at a disadvantage with competitors freely using the technology.

The reasoning behind this solution is as follows: The licensor should not be obliged to assume all the risk of a premature entry of his know-how into the public domain, i.e., either litigation costs to prove that it is still secret or has entered the public domain through the fault or even by a deliberate act of the licensee, or the loss of a substantial part of the agreed royalities in the event of disclosure of the know-how by third parties. If he were obliged to run this risk, he would either prefer not to license at all or would insist on heavy down-payments and high initial royalties. This would discourage the licensee from taking the licence. When a licence is freely negotiated, the price agreed reflects the risks which the parties are prepared to share, including the risk that the know-how might enter the public domain during the life of the contract. The value of the licensed know-how consists in giving the licensee a lead-time over his competitors to whom the same or equivalent technology is not available. By the time he could develop the know-how himself, the technology might be out of date. He is therefore paying primarily a negotiated price for this lead time.

However, if the know-how has fallen in the public domain through the action of the licensor, the licensee should be freed from his obligation to pay royalties.

Furthermore, the contract may frequently not only cover the communication of know-how not in the public domain, but the know-how possessor may have also supplied other non-secret information or work over and above it, which continues to be important for the licensee (e.g. technical assistance). In these cases, whilst other competitive restraints on the licensee should no longer be covered by a block exemption from the time the know-how has entered the public domain, royalty payments could still be lawfully agreed for a limited period of time.

vi) Minimum quantity

An obligation on the licensee to produce a reasonable minimum quantity of products derived from the licensed know-how serves to ensure an effective exploitation of the know-how and meets a legitimate interest of the licensor.

7. Clauses which may normally be considered to fall within Article 85(1)

i) Field of use

Modern technology is strongly characterized by its interdisciplinary and intersectorial application. Allowing a restriction on the licensee to use the know-how only in certain technical fields of application gives an incentive to the licensor to disseminate technology in other sectors. This will result in new applications and products. Meanwhile, the licensor can reserve for himself the fields in which he is primarily interested. In particular, field-of-use restrictions allow smaller firms to license their technology to large companies for applications in other fields while keeping for themselves the areas in which they can apply their own technology without the threat of competition which the greater financial resources of their licensees would otherwise make possible.

Such restrictions can fall under Article 85(1) as they prevent the licensee from using the know-how in the excluded fields of use and thus from manufacturing and selling the products incorporating the licensed technology, but they can normally be exempted under Article 85(3). An obligation on the licensor not to exploit the know-how within the field of use granted to the licensee may be examined in the general context of exclusivity obligations dealt with in point (v) below.

Field-of-use restrictions which amount to de facto customer restrictions fall to be considered under (ii) below.

ii) Customer restrictions

Restrictions in respect of sharing customers within the same technological field of use, either by an actual prohibition on supplying certain classes of customer or an obligation with an equivalent effect, cannot be exempted under a block exemption. An exception might be allowed where a second supplier is needed either to provide a second source of supply at the customer's insistence or because the first supplier cannot satisfy the totality of the customer's demand. Such cases should be examined on a case-by-case basis.

iii) Price restrictions

Restrictions on the price at which the licensee can sell the licensed products are normally unacceptable. They should be blacklisted in a future block exemption regulation.

iv) Quantity restrictions

Quantity restrictions are normally unacceptable and should be blacklisted. However, an exemption might be envisaged when the licensee wants to produce only enough of the product to cover his own needs, or when the licence is granted for the purpose of creating a second source of supply as mentioned in (ii) above.

v) Automatic extension of the agreement by the licensor to cover improvements not originally licensed

The exemption will be unavilable if the agreement provides for the automatic extension of the licence beyond its original term by inclusion of any improvement obtained by the licensor, unless each party has the right to terminate the agreement at least annually after expiry of the original term.

vi) Exclusivity of use and territorial restrictions

--Economic reasons for exclusivity and territorial restrictions

The licensor may find it difficult to transfer his know-how if he is unable to promise a licensee that he will not encounter competition from other licensees or the licensor himself in the allotted territory. The licensee will be unwilling to undertake the risk of the investment and marketing costs

involved in the introduction of the licensed product in the market if exclusivity of manufacturing and sale for a given territory is not guaranteed by the licensor.

The same is true from the point of view of the licensor, who would be acting against his business interests if by licensing his technology he created a direct competitor in his reserved territory.

Several arguments in favour of territorial restrictions put forward in the recitals of the Patent Licensing Regulation are also valid for know-how licenses; for example:

--Protection of the licensee's investment and marketing efforts;

--Territorial restrictions encourage the licensor to grant licences and make the licensees more inclined to undertake the investment required to manufacture and market a new product;

--The resulting increase in the number of production facilities and in the quantity and quality of goods produced in the common market;

--Consumers are as a rule allowed a fair share of the benefit resulting from the improvement in the supply of goods incorporating the latest technology;

--Competition at the distribution level is safeguarded by the possibility of parallel imports.

--Territorial exclusivity

Exclusive licensing agreements, i.e. agreements whereby the licensor undertakes not to exploit the licensed know-how in the licensed territory himself or to grant further licences there, do not in themselves fall within Article 85(1) where they are concerned with the protection of new technology in the licensed territory. This is because, in such cases, the competition eliminated would not have existed at all without the licensing agreement.

Where, in other circumstances, exclusivity provisions do not fall within Article 85(1), they should be exemptable under Article 85(3). The Commission would, as in the Patent Licensing Regulation, permit varying degrees of territorial protection as between the licensor and the licensee /and as between licensees inter se/ and make exemption subject to the following conditions:

--The period during which the licensor undertakes not to grant further licences in the licensed territory or to manufacture in and export directly to the licensed territory himself should generally not exceed ten years from the date when the product is first placed on the market within the EEC, as this period is generally considered in industry to be the normal life of know-how agreements.

--The agreement should enable the licensor to terminate the exclusivity on the expiry of a period of five years from the date of the agreement if, without legitimate reason, the licensee fails to exploit the technology adequately.

--Territorial restrictions on the licensee

Know-how licence agreements may provide for territorial restrictions on the licensee. Obligations on the licensee not to manufacture or sell products derived from the licensed technology in territories reserved for the licensor and not to manufacture or make active /and passive/ sales of such products in the territories of other licensees should be exemptable under Article 85(3). The Commission would make exemption subject to the following conditions:

--The duration of obligations on the licensee not to manufacture in or export products derived from the licensed technology to the territory of the licensor should generally not exceed /ten/ years from the date when the products concerned were first placed on the market within the EEC.

--The duration of obligations on the licensee not to make active /and passive/ sales of products derived from the licensed technology in the territories of other licensees should generally not exceed five years from the date when the products concerned were first placed on the market within the EEC.

--An obligation on the licensee not to use the know-how for manufacture in the territories of the other licensees should generally not exceed /ten/ years. Such a restriction has acceptable anti-competitive effects, since the licensee would be free to sell the products in the territories of other licensees after five years.

These cut-off dates should give the licensee sufficient time to recoup the cost of his investment in development, full-scale production and introduction of the product on to the market and would also be considered by the licensor as being a sufficiently long period in which he would not be exposed to competition from his licensee. Longer-lasting territorial restrictions could mean that a substantial part of the benefit connected with the licence would not occur or would be neutralized by anti-competitive effects.

A specific problem arises in licences covering a continuous stream of improvements of know-how. It is proposed that the addition of improvements to the licensed technology should not entail an extension of the period of protection. To allow an additional period of territorial protection every time a further transfer of improvements takes place would result in an open-ended restriction.

In no event can any prevention or hindrance of parallel imports be allowed. Since competition at the distribution stage is ensured by the possibility of parallel imports, know-how agreements will not normally afford any possibility of eliminating competition in respect of a substantial part of the products in question. This is also true of agreements that allocate to the licensee a contract territory covering the whole of the common market. However, in this case intermediaries or users should not be prevented by the parties from obtaining the contract goods from outside the common market. In relation to services, in which there is no parallel trade, it is essential to provide that requiring the licensee, after any initial period in which a territorial restraint would be permitted, not to provide a service in

territories licensed to other licensees within the common market would preclude application of the block exemption.

vii) Non-competition clause

Obligations which restrict the licensee's freedom to compete with the licensor in respect of research and development, manufacture, and use or sale of products based on technologies other than those licensed normally fall under the prohibition of Article 85 because of their tendency to exclude competing technologies. The prohibition of such restrictions must however be reconciled with the legitimate interest of the licensor in having his know-how exploited to the full. Accordingly, the licensor may require the licensee to use his best endeavours to manufacture and market the licensed product. Such a requirement does not restrict competition within the meaning of Article 85(1).

viii) Post-term prohibition on licensee's use of know-how

Another of the more controversial aspects of know-how licensing is whether a licensee may be required to return at the expiry of the agreement all tangible know-how to the licensor and to stop using all the know-how received, at least as long as it remains secret. This clause can be found in almost all agreements which have been notified to the Commission.

Two different views are generally taken on this question:

It can be argued that it acts as a strong disincentive to prospective licensees and consequently cannot be exempted under Article 85(3). The reasoning behind this view is that by taking a license to the know-how the licensee has lost for ever the possibility of developing, i.e. "rediscovering," the know-how himself.

It can also be argued that such clause is acceptable. This follows from the recognition of the know-how licensor's right to dispose of the know-how under contractual arrangements. Parties should be free to decide whether to regard the communication of the know-how as a final, irrevocable act akin to a sale or as a leasing relationship limited in time.

The following solutions are here suggested:

Firstly, parties should be allowed to include such a clause in an agreement providing for use of technology for a specific project (e.g. a large-scale constructive contract). Refusal to allow a post-term prohibition on the licensee's use of the licensed know-how where either party should be reluctant to enter into an agreement providing for a transfer of technology for a longer duration would inhibit the dissemination of technology.

Apart from these specific cases a post-term use ban could be generally accepted where all the following conditions apply:

--The prohibition on the licensee's use is limited to /three/ years from the expiry of the agreement. It could be argued that this period corresponds in general to the time it would have taken the licensee to develop the know-how himself.

--The licensor is required to identify and describe in as much detail as possible the confidential information in the agreement and to maintain a record which reflects an accurate compilation of subsequent confidential information transferred during the course of the agreement. That would prevent the licensee from being unduly restricted in the utilization of his own technology or of that which is freely available elsewhere and would generally alleviate the problem of improvements added by the licensee.

--It is clearly stated that such a clause is no longer allowed as soon as the licensee can prove that the know-how has become public knowledge or that he has acquired know-how of identical content from a third party.

In all other cases the clause should be subject to individual examination.

/9274
CSO: 3698/278

EEC ADOPTING REGULATIONS TO FACILITATE HIGH TECH INVESTMENT

Brussels EEC INFORMATION MEMO in English No P(86)96, Dec 86

[Article: "Financial Engineering at the Service of Community Action]

[Text] The Commission has just approved the first communication to the Council and to Parliament on financial engineering. The communication sets out the reasons for developing financial engineering on a Community scale and explains the significance of this activity. At the same time, the Commission also approved a second communication on the financing of large-scale infrastructure projects of European interest, which represents the first practical step taken by the Commission in this field.

What is financial engineering? The Commission uses this term to describe action designed to promote the development of financing instruments which best meet the needs of firms, particularly small and medium-sized businesses (SMEs) and which facilitate the financing of projects of particular interest to the Community, such as large-scale infrastructure projects or high-technology projects.

Why financial engineering on a Community scale? The Commission points out that the Community finds itself in a new environment in which governments are keen to reduce their budgetary involvement and to assume a less pronounced profile while funds available from private sources are plentiful. In addition, financial markets are experiencing rapid change and witnessing the emergence of a whole range of new instruments. This has led Member States to reshape their operations and instruments in order to adapt them more closely to their requirements. At the same time, the growing interpenetration of economies, which fits in with the logic of the drive to establish an integrated economic and financial market in Europe, is giving a European dimension to these developments.

The Commission therefore considers that an approach similar to that adopted in Member States should be adopted at Community level by adapting the supply of financial resources to transnational needs. This is what the Commission means by financial engineering. Through it, the Commission plans to exert a catalytic, multiplier and leverage effect on private capital.

Mr Matutes, the Member of the Commission responsible for this sector, commented as follows: "Being subject to budgetary constraints similar to those experienced by the Member States, this even initiative is not intended to develop sources of Community funding, whether of a budgetary nature or through borrowing; the aim is instead to re-examine the methods and instruments of Community action, with greater emphasis being placed on the spirit of initiative and the working of market forces".

Commission Action

The Commission's financial engineering activities will include the following specific measures:

- mobilization of a lending capacity to expand the supply of finance for priority measures (SMEs);

- inducement to set up investment companies to improve the provision of equity capital (e.g. high-technology projects);

- assistance towards the establishment of a guarantee fund for the acquisition of temporary holdings (innovation projects);

- granting of a budget guarantee to convert conventional loans into non-recourse or limited-recourse loans (large-scale infrastructures);

- provision of equity capital to prime the putting together of financial packages for large-scale projects;

- assistance with the establishment of service agencies (financial services but also consultancy, help with setting up abroad, finding partners);

- signalling of a political priority conferring a number of advantages ("declaration of European interest" for large-scale projects).

The Thrust of Community Financial Engineering

Financial engineering must be at the service of Community action and must assist attainment of the Community's major objectives: unifying the internal market, technological progress, job creation, improving industrial competitiveness and integrating the outlying regions.

However, three priorities are currently at the centre of the Commission's preoccupations: reviving the spirit of enterprise, industrial renewal and Community cohesion. On the basis of these priorities, three areas can be identified in which financial engineering is needed.

1. Reviving the spirit of enterprise: financing of SMEs

The task here will be to continue and expand those measures already undertaken which are aimed at increasing the supply of loan funds (NCI IV), at providing access to credit for firms whose financial standing is too low to provide the guarantees required (development of mutual guarantee machinery), at increasing

the equity capital of SMEs (promotion of European venture capital) or at providing them with the financial and other services they need in order to grow.

2. Industrial renewal: financing of high technologies

Equity capital is the best way of financing projects at an intermediate stage between research and industrial application. However, the provision of equity capital is all the more difficult to organize if the project is the result of international cooperation or if it is a long way back in the chain which runs from research to industrial application.

To overcome this particular difficulty, the Commission has launched a number of new ideas, after verifying their relevance with the financial community and with professional circles. They relate to the setting up of investment companies (EUROTECH CAPITAL), with exclusively private capital, and the establishment of a guarantee scheme (EUROTECH INSUR) that would be publicly and privately funded and would back up the EUROTECH CAPITAL companies. The favourable response to these suggestions and the prospect of early establishment of the first EUROTECH CAPITAL company open the door to the institution of the guarantee scheme that would complete the machinery.

3. A contribution to Community cohesion: financing of large-scale infrastructures

The concern here is with large-scale infrastructure projects of European interest, for which a large amount of capital has to be assembled in special forms and using special procedures.

The Commission, which has just approved a communication to the Council on this specific point, intends to call for a redistribution of roles in the promotion, financing and management of such projects and for an improvement in the environment for private investors so as to facilitate and encourage the provision of private capital. The new role that the Community could play would be threefold:

- to provide the requisite conditions for the emergence and launching of large-scale projects,

- to improve the environment for private investors, and

- to mobilize the market through a renewed form of Community assistance.

CSO: 3698/A098-E

ESPRIT PROGRESS REPORT SUBMITTED

Brussels EEC INFORMATION MEMO in English No P-98, Dec 86

[Article: "ESPRIT: Tangible Results with Significant Industrial Impact Are Beginning To Emerge"]

[Text] The Commission has just approved a communication to the Council describing in detail the progress and results of the first phase of the ESPRIT Program. Among other issues the report also touches on the potential economic impact and industrial application of projects.

A Quick Start-up and Steady Progress

Since ESPRIT was launched and based on annual calls for proposals, 201 precompetitive R&D projects are underway in the areas of Microelectronics, Information Processing Systems (Software Technology and Advanced Information Processing) and IT Applications (Computer Integrated Manufacture and Integrated Office Systems).

ESPRIT has been successful in promoting trans-European cooperation between IT organizations. Aside from universities and research institutes there are now 240 different industrial partners, 130 of which are small and medium-sized enterprises. The highly qualified researchers assembled by ESPRIT have reached an estimated 2,900 by mid-1986.

Representative Examples from the Five Subprograms.

The trans-European cooperation fostered by ESPRIT is now beginning to produce concrete, deliverable results. Projects nearing completion have realized all or almost all of their targets and most of those started later are meeting their envisaged milestones on schedule. Although only 3 years into a 10 year Programs. specific results with major industrial impact are already being implemented.

In Microelectronics, an example of a tangible result is a demonstrator chip containing 10,000 (10K) basic elements in a chip and 200 picosecond access time. This so-called 10K array bipolar chip has characteristics which compare with the best in the world. As a spin-off from this R&D project a new line for the production of these arrays is being built by Siemens, at a cost of

around 100 MECU. The development of prototypes is planned for next year, to be followed by full production.

In Software Technology a shift is now discernable in the product development strategies of some key European companies attempting to ensure maximum benefit from the collaborative work being undertaken within ESPRIT. A most significant output so far has been the result of work on a Common Software Development System, PCTE, which brought together six of the major computer companies within Europe (Bull, GEC, IC, Nixdorf, Olivetti, Siemens) with the goal of producing software faster, safer, and more efficiently than the current state of the art. The results obtained have already gone beyond meeting the original goals to spawning extensive complementary work both within ESPRIT and elsewhere, i.e. prototypes of the system were developed and evaluated, while a commercial implementation of a software product called EMERAUDE, was produced by GIE-Emeraude and released to the market in September 1986 - a prime example of timely exploitation of ESPRIT R&D results by industry. This work is having wide industrial impact as well as on Member States R&D programs.

In Advanced Information Processing work was carried out in Knowledge Engineering, External Interfaces and Computer Architectures. As an example of work in the first of these areas, advantage was taken of Europe's strong position in logic programming languages by producing state-of-the-art versions of such languages to be used in knowledge based systems which is illustrated by the following examples which relate especially to the language Prolog:

As a direct result of an ESPRIT project the Belgian Institute of Management has recently released BIM-Prolog, a computer based Prolog development system with a compiler producing code which executes faster than code produced by any other Prolog compiler in the world.

In another project Daimler Benz, Bosch, GIA, GIT and Prolog IA came together to further develop Prolog into an enhanced new language, Prolog III, with the intention of using it to build a knowledge based system for the diagnosis of failures in automobile engines.

In the IT Applications area results on standards are of particular interest.

The work in the Multimedia Office Document Architecture based systems (ODA) was aimed at defining a multimedia document standard. It was an early ESPRIT project (Handling of mixed text/image/voice documents based on a standardized office document architecture - HERODE) which developed the European (ECMA) and worldwide (ISO) office document architecture standards. While further work is being done to expand the ODA Standard, a powerful on-line editor and tools were built to define, manipulate, store, retrieve and transmit documents in the ODA format. It was implemented on a commercially available workstation equipped with a specially designed picture scanner for the input as part of ODA documents and with a bit-map printer for output. This system has been demonstrated at technical exhibitions.

Although a small part of the overall Computer Integrated Manufacturing effort, standardization work in this area has also been particularly promising. The Communication Network for Manufacturing Applications project has brought together major IT vendors and users with strong links to the U.S. National Bureau of Standards and the General Motors standardisation plan (MAP) to implement factory communications protocols, which will be applicable not only in the automotive industry, but in most other industries entering the era of factory automation.

The impact of ESPRIT on standardisation is being felt internationally. By finding a common voice, European industry now is in a very good position to take a leading role in the definition of world standards in IT and to exploit the resulting market opportunities.

SME Participation in More Than 50 Percent of ESPRIT Projects

ESPRIT is paving the way for a European Technology Community. This means creating and promoting transnational opportunities for European companies, leading to technological renewal and economic competitiveness. As such the dynamic role of small and medium-sized enterprises [SME] is self evident. ESPRIT is laying the ground for technology transfer, and encouraging small and medium-sized enterprises to participate. Over half of ESPRIT projects count the participation of at least one SME (defined as a company with under 500 employees). In the case of some small industrial organisations ESPRIT work often accounts for the greater part of their R&D activity. Without ESPRIT such organisations would not have the funds available for significant research activity nor would they be able to benefit from international collaboration.

CSO: 3698/A097-E

HUNGARY TO CONCENTRATE CHIEFLY ON ROBOT CONTROLS

Budapest MAGYAR HIRLAP in Hungarian 20 Aug 86 p 7

[Interview with Imre Szabo, State Secretary for Industry, date and place not specified]

[Text] The five main directions of the Complex Program worked out by the CEMA countries for the period ending at the turn of the millennium are: electronization of the national economy, the search for new materials, biotechnology, accelerated development of atomic energy, and complex automation. It is primarily inthese five areas that specialists will want to unify their scientific and technical efforts in the future. Imre Szabo, State Secretary for Industry, has given our newspaper an interview on the problems of automation, the main direction which will determine the future competitiveness of our country's machinery industry.

[Question] The designers of the Complex Program, which embraces all high technology sectors, hope that the acceleration of development will close our technology gap. Where are the starting blocks from which Hungarian specialists can spring forward for their run?

[Answer] It would scarcely be correct to make a rigid division between the problems of the individual main directions because they are built on one another and supplement one another. For example, the solution of automation problems is affected by the results of computer, peripheral, and microelectronic elementbasis developmentcarried out as part of the main direction aiming at electronization of the national economybut they are also closely associated with the power plant control problems arising in the development of atomic energy or the instrumentation problems involved in biotechnology or in the search for new materials.

In many fields, for example, in biotechnology and the pharmaceuticals industrythe program found Hungarian research in a relatively developed state, since these had already become prominent subjects of research, so that Hungarian investigators in these fields could boast of outstanding successes even when judged by the standards of the developed industrial countries. In the concept of industrial development we can attach great importance to automation and robotization, and after the significant developments of recent

years we can now claim one of the foremost places among the socialist countries in the manufacture of instruments and automation equipment.

We have started too

[Question] You also mentioned stabilization. But in this area you can hardly have any reason to feel satisfied, since most of the socialist countries are ahead of us in the development and application of such equipment. In the German Democratic Republic, for example, 50,000 robots had been put to work by the end of last year.

[Answer] Hungary has never had and still does not have any industrial sector such as passengercar manufacturethat would require robots in great numbers. The German Democratic Republic's industry is much more extensive than Hungary's, in many branches it is more developed as well, and the execution of central programs is more tightly controlled. But their lead in the application of robots is based primarily on their larger market.

[Question] The fact that Hungary's stock of robots [and users] amounts to no more than a couple of dozen is only one side of the question. Even at these few robotusing plants there seems to be an unduly wide variety of types and licensers.

[Answer] But still, you cannot say that our country's robot program is not thought out carefully enough or that it is not in harmony with development in other socialist countries. At this spring's Budapest International Fair there were already some Hungarian firms showing simple manipulators, of the kind adaptable primarily to typical Hungarian mass production. We saw Hungarian produced laboratory instrument robots, machinetool robots and furnaceservice robots capable of lifting weights of several hundred kilograms. At one end of this scale of robots precise operation is the decisive factor, but at the other end it is less important than the capacity to handle larger loads. To cover such a broad spectrum of applications with a single type of robot would have been impossible.

In robot manufacture, during earlier years, the socialist countries started their development work on the basis of diverse technical concepts, element bases, and licenses, and there are still some blank spaces in the area of their backgroundindustry, electronics, and softwaremanufacturing capacity and services. It was precisely to promote more effective cooperation that we joined in the work of the "Interrobot," International Scientific and Production Association.

With the requirement of competitiveness

[Question] In the light of the results achieved in research and development so far, what can Hungarian industry undertake to do in robot production?

[Answer] Hungarian robot development has reached such a level that our industry is now capable of manufacturing several types of this equipment. However, it is not our purpose, and it would not be economical, to concern ourselves with the development of robot types that are manufactured in other socialist countries.

Hungarian specialists have achieved noteworthy successes first of all in the control of robotsfor example, in the design of socalled shaperecognizing systems. Thus, according to our plans, we will not only offer two or three types of robot in complete form but also produce control electronics, as needed, for robots produced in other socialist countries, for applications in which our domestic manufacturing has already grown to maturity.

What we are most interested in is making sure that the products of Hungary's machinetool industry, supplemented with robots, will be competitive over the long term even on the most exacting markets. By the turn of the millennium, according to our plans, Hungarian industry will produce a total of 80 to 150 such robotserved flexible manufacturing systems.

[Question] Speaking of manufacturing systems, it appears that in foreign countriesincluding some of the socialist countriesthere is much more emphasis in the public mind on automatic design and control systems.

[Answer] We must accept it as a natural fact that in some countries, when central programs are started, there is even more talk than usual about their significance. As far as the situation in Hungary is concerned, the intellectual groundwork for complex automation has already been laidfor example, at the Technical University of Budapest, at the Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences, or at the Technological Institute of the Machine Industries. On the other hand, it is a fact that in comparison with the possibilities for application, the circle is still somewhat restricted and thatapart from the assembly line operating at the Csepel MachineTool Factoryall we have managed to do thus far is create the intellectual preconditions; integrable equipment capable of functioning in systems as well is largely still lacking.

To give a clearer idea of what I mean, consider that preparing a card for a textile pattern used to take as much as two days, but now, with computers, it takes less than two minutes. Yet it is useless to have an unprecedentedly fast planning system for textiles if after it we do not have a knitting machine to which the new pattern can be transferred at the push of a button.

The world is moving in this direction too

[Question] More than one specialist concerned with the manufacture of automation systems believes that our domestic market conditions, our expenditure structure, and our labor supply, which still is less expensive, are not exactly favorable to the expansion of such modern equipment.

[Answer] One point we agree on is that in order to be able to utilize its automation investment for improving its profitability, a firm must also be able to make its prices reflect its ability to provide prompter deliveries, faster service, and higher quality. All this is, of course, impossible without genuine market competition.

At the same time, however, in many of our factories there is a significant amount of machine capacity doomed to idleness for lack of manpower; this too should spur an enterprise to apply automation more extensively.

[Question] We've wandered somewhat far afield, however, from the Complex Program. When it was published at the end of last year, the national economic plan had already been largely prepared in the countries concerned. How much success has there been in fitting the tasks undertaken in the program into our national plan purposes?

[Answer] I must correct a popular misconception. It is totally untrue that we have a national economic plan and a CEMA program independent of it. Unity must be achieved within the plan; the only thing is that no enterprise can expect participation in the Complex Program to bring it any preference or exemption from the requirement of efficiency.

Moreover, we have been able to bring the national economic plan into complete harmony with the objectives set by the Program. Development all over the world is moving in the same directions. This does not imply by any means that there have not been certain shifts in emphasis. For example, Hungarian ideas in the past had not envisaged the development of electronic control systems for robots manufactured by others.

Cooperation is built on a system of treaties and civil contracts. Many of the previously concluded multilateral treaties on economic cooperation and scientific and technical cooperation have been expanded and made part of the work of the Complex Program as well. During the past few months we have concluded 20 to 25 new cooperation treaties. Working out concrete civil contracts between enterprises will be the task of the near future, and in a few areasprimarily those in which we need do no more than carry out some minor "additional development" or fit massproduced items into a systemthe first results of the Complex Program may be expected as early as 1987.

Methods of financing

[Question] One fundamentally new feature of the Program is that it is based chiefly on direct contacts between enterprises. But enterprises in the individual socialist countries work under substantially different regulations. In these circumstances, how can economic units be given an incentive to take part in this cooperation? And in general, how will the work associated with the Program be financed?

[Answer] When the Program was worked out, three possible methods of financing were specified: financing with the participants' own resources, with jointly created funds, or with credits obtained from the international financial institutions of the CEMA countries. However, the concrete form of the financing, division of expenditures, and accounting questions, will be agreed upon in civil contracts between the enterprises involved. I should mention that even in the past there had been a fairly wide circle of contractual developmental assignments in which the settlement of accounts between the parties involved foreigntrade enterprises marketing intellectual products. A similar solution may be expected in the case of the Complex Program.

As regards the other part of the question, the individual socialist countries have taken actions at the governmental level in order to ensure that even within the limitations of the different regulatory systems, opportunities would be created for undisturbed cooperation with other countries' industrial

enterprises and institutions. As an example, among other things, in the Soviet Union the participants in the Complex Program are granted a significant degree of independenceprimarily for the maintenance of contactsand they are also provided with special developmental sources. However, the legal and economic environment of the economy of domestic enterprises was consistent with participation in the Complex Program even in the past, and therefore there is no need for any further comprehensive actions.

The question of prices

[Question] Lastly, the still somewhat slow rate of formulation of CEMA standards, and especially of adaptation to them, is scarcely consistent with the "ideas of acceleration."

[Answer] To begin with, significant results have been achieved even before this in international standardization. Among other things, in the case of atomic power plant equipmentwhere necessaryit has been possible to harmonize the standards in a matter of months. Attention must also be given to the fact that economically it is firmly predetermined what is standardized in a country and what is not. Excessive standardization cannot be regarded as an objective, since it would lead to uniformization, which would retard international trade. Moreover, in the formulation of standardsespecially in economies, such as ours, which are open in every directionconsideration must also be given to the question of what markets any particular group of products is aimed at, and this may create more rigid requirements than the domestic demands of the moment may impose. In the seventh Five-year Plan we intend to make significant advances in quality, and we will do everything to see to it that this high standard is also reflected in our prices.

12385
CSO: 2502/2

USE, PRODUCTION OF NC-CNC MACHINES FALTERING

Budapest FIGYELO in Hungarian No 42, 16 Oct 86 p 7

[Article by Zoltan Nadudvari: "Advanced Technology--Part Time"]

[Text] A radical change in automating the manufacturing procedures of the processing industry--and particularly the machinery industry--was brought about, beginning in the 1960's, by the increasingly widespread application of numerically controlled equipment. In our country numerically controlled machine tools have been used since 1964. Application on an industrial scale was developed in the 1970's, and NC-CNC-controlled equipment came to represent a larger proportion of existing machinery, both in number of machines and in monetary value. In the 1980's the development opportunities open to enterprises shrank, and this made it appreciably more difficult to increase the amount of numerically controlled machinery or to exchange and replace machinery that had been completely written off.

Of the numerically controlled machines acquired between 1981 and 1985, 351 had been made in Hungary, 109 imported from capitalist countries, and 73 imported from socialist countries.

The end-of-year gross value of standing means of production at enterprises in the machine industry in 1985 was 144.8 billion forints, and the gross value of machinery and equipment within this figure was 74.7 billion forints.

In 1985 production equipment with a gross value of 60.6 billion forints was used as basic operating machinery by machine-industry enterprises which are under ministry supervision, to manufacture their own products and the components and partial units of those products. The enterprises are using a smaller proportion of the machines as auxiliary operating machinery (for machine repairs, the production of tools and devices for their own use, power sources for the enterprise, moving and storage of materials, etc.).

Table 1. End-of-year gross value of standing means of production and of machinery and equipment in the machine industry (1980-1985)

Designation	1980	1985	Index, percent 1985/1980
	current prices, millions of forints		
Standing means of production	121 600	153 418	131.5
Including			
- State industrial enterprises	116 472	144 835	126.3
- Industrial cooperatives	5 128	8 583	157.1
Machinery, equipment	62 932	78 034	124.0
Including			
- State industrial enterprises	60 865	74 715	122.8
- Industrial cooperatives	2 067	3 319	160.6

NC-CNC-controlled machines constituted 16 percent of the more important basic operating machinery. The stock of numerically controlled machinery increased by 13.3 percent in 1985. The change in the breakdown of the stock of machinery according to technical level indicates that a growing percentage of the investment for basic operating machinery in machine-industry enterprises was spent on automated and program-controlled machine tools. The number and value of conventional machines without any control and of automated machines with mechanical control decreased substantially, especially in machine imports which require convertible accounting.

More than 90 percent of the numerically controlled machines were operated in the machine industry; in 1985 there were 945 such up-to-date basic operating machines at 82 enterprises. A few numerically controlled metal-working machines are operated at foundry, plastic-processing, and glass-industry enterprises (to produce manufacturing equipment), at the repair shops of industrial enterprises, at secondary and advanced educational institutions, and at research and development institutes.

More than four-fifths of the numerically controlled basic operating machines in the machine industry were used for metal-cutting processes; the figure in 1985 was 88.5 percent. (The proportion of metal-cutting equipment is 59 percent in numbers of machines and 50 percent in value.)

Forty percent of the observed machine-industry enterprises (55 enterprises in 1985) operated numerically controlled machines; these were mostly medium-sized or small machine-industry enterprises. The average value of numerically

controlled machines was 8.1 million forints in 1984 and 7.8 million forints in 1985, approximately four times the average value of all basic operating machines combined.

The level and range of background services associated with up-to-date metal-cutting machine tools is growing rapidly throughout the world; operators of such machines can order ready-to-use programs and planning procedures for work items from enterprises specializing in this field and from engineering offices; they can also order standard-connection diagnostic and simulation equipment and even special manufacturing equipment if necessary. The great majority of such software services have not yet taken shape in our country, and application experience which has proved itself elsewhere is also more difficult to circulate in Hungary because operators are uninterested, uninformed, and unprepared. For the past several years, domestic machine-tool factories and the experts of the Machine-Tool Programming Association [Szerszamgep Programozasi Egyesules] have been giving advanced training courses whose successful completion constitutes middle-level or advanced-level qualification for operators, technicians, programmers, and repairmen of numerically controlled machine tools, according to an order issued by the Ministry of Industry.

One-fourth of the basic operating machines and a larger percentage (29-30 percent) of numerically controlled machines have been working on a three-shift schedule for the past two years. One-third of the basic operating machines have been operated only one shift a day, and this figure includes one-fifth of the NC-CNC machines. The values of all machines used in a third shift and of numerically controlled basic operating machines within this figure made up almost the same percentage (35-36 percent). The breakdown of numerically controlled machines according to number of shifts is the following:

- the proportion of those operated in three shifts was highest for plastic-manufacturing (69.7 percent) and foundry (73.3 percent) equipment;

- among machines used in only one shift the prominent percentages were those of machine-industry presses (40.2 percent), grinding and finishing machines (42.9 percent), and communications machinery (66.0 percent).

The average number of shifts for all basic operating machines combined--on the basis of quantitative data--was 1.92 in 1984 and 1.91 in 1985; numerically controlled machines were used in 2.11 and 2.09 shifts, respectively.

A few large continuous-operation foundry installations and vacuum-technology and metal-finishing manufacturing lines were used in four shifts. Among numerically controlled machines (on the basis of value data) the highest numbers of shifts were those for machines of the planer type (2.80), plastic-manufacturing equipment (2.70), and foundry equipment (2.56).

Somewhat more than half of the calendar time base of all basic operating machines (51.3 percent in 1985) was made up of work-schedule time bases, and the utilization of maximum time bases was not much more favorable for NC-CNC machines (57.3 percent in 1984, 55.6 percent in 1985). The utilization values of work-schedule time bases during the two years studied were 73,9 percent and

77.2 percent for all basic operating machines; there was a smaller improvement (from 75.7 to 78.6 percent) in the somewhat more favorable indicator for the more valuable NC-CNC machines.

NC-CNC machines were operated for 46.7 percent of their calendar time base in 1985 (46.3 percent in 1984); within this figure there is a wide dispersion according to enterprise size and individual groups of machines.

In industrially developed countries there is a growing demand for numerically controlled machines that can also be used for forming flexible manufacturing units, manufacturing cells, and manufacturing lines. In our country (apart from a few exceptional cases) the NC-CNC machines acquired at different times and having different technical levels, different program software, different degrees of completeness, and different generations of a given type, and acquired (often hastily and capriciously) from different countries and firms, cannot be used for forming flexible manufacturing equipment.

13285
CSO: 2502/6

ROBOT PRODUCTION OFFSHOOT OF ARTIFICIAL INTELLIGENCE RESEARCH

Budapest MAGYAR NEMZET in Hungarian 3 Sep 86 p 5

[Interview with Dr Laszlo Nemes, Scientific Main Department Head in the SZTAKI (Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences), date and place not specified]

[Text] In our exploration of the factors making up the Hungarian robot story we had arrived last time at the finding that robot manufacturers prefer to build Western control equipment into their machines, since it has proved its value and costs no more--in fact, sometimes less--than Hungarian equipment. It is less widely known that a scientific institution in Buda, the SZTAKI (Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences), has developed a general robot control system which has been connected to an American-made Puma robot. The Hungarian intellectual product passed its tests with flying colors... According to reports, it will soon have a chance to show its mettle on robots made in the German Democratic Republic and in Finland. But not on Hungarian ones--for the time being... And this despite the fact that if it were connected to a Hungarian robot, it would make a complete Hungarian sales item. But if the researchers cannot get a Hungarian robot because they cannot borrow one and have no money to buy one, how shall they test their system?

This circumstance not only reflects a momentary stalemate but perhaps also suggests that in Hungary, researchers and manufacturers are struggling in isolation from each other. Some manage to succeed one way, some another, occasionally finding partners more easily abroad than at home. We have put some questions to Dr Laszlo Nemes, Scientific Main Department Head in the SZTAKI, in an attempt to look behind this oversimplified statement.

Theories at the global level

[Question] Hungary's robot-manufacturing industry is laboring to give birth to something useful. Could one reason be that Hungarian robot research has been too long delayed?

[Answer] As I recall, the development of shape recognition and robot research was begun at the Institute in 1974. Pneumatic robots--or more precisely, manipulators--which are suitable for simple tasks and can be put together quickly from available elements were manufactured in one of our departments even earlier, and the manufacturing rights to one of them were handed over to the Egri Finomszerelvenygyar. The reason for the start of research on intelligent robots at the Institute was that basic research on artificial intelligence was going on, the decision-making mechanism of the thought process was being examined, shape-recognition procedures had been worked out, and robots were needed as a means of demonstration. Sometime in 1975 we actually produced two home-made prototypes. At that time nobody had yet thought that Hungary would need to manufacture robots, especially intelligent ones. Thus Tibor Vamos and his group began their research at an early date. References to them, or rather to their results, have often been made in foreign journals and textbooks.

[Question] And what did people abroad eventually recognize?

[Answer] In those days research on artificial intelligence was in its infancy everywhere, and the mathematical solutions and algorithmic procedures developed here were considered novelties. The variations we developed were such that problems of greater and greater complexity could be solved on smaller and smaller computers. Finally, when the machine-industry automation program of the Sixth Five-Year Plan was prepared, the Institute undertook to develop shape-recognizing equipment and to conduct research on a general robot control system. Concerning the shape-recognition system, it is perhaps worth saying that a camera equipped with an optical input "looks at" the objects placed in front of it, and the system can later identify these, or indicate that they are different from those that it has studied. This is of great significance in machine-industry processes; it can be used for quality control, since the system distinguishes those items of work which deviate from the standard. It is also usable for the automation of assembly work. In fact, such a shape-recognizing system is used by the Bakony Muvek on its assembly line, precisely as one of the research-and-development results of the Sixth Five-Year Plan. They were able to have it manufactured by a cooperative... The system is still being developed today, in order that it may be used for a wider range of tasks. We are also working on the programming of robots and robot systems. We have said that we don't care what kind of mechanical systems are produced by Hungarian industry. We design the programming system, the shape-recognition equipment, and the control to be so general that it can be connected to any of them...

We do have the relay baton...

[Question] ...until you finally wound up with an American robot...

[Answer] We presented our control system to Hungarian industrial experts last December. We consider it an up-to-date solution. And since Hungarian manufacturing is delayed and we have not managed to agree on who should make control systems or shape-recognition equipment for what robots, we looked for foreign contacts. Several years of our work have been invested in these systems. It is a matter of conscience for a researcher to see his work become reality, and it is also important to the Institute that the finished research should be profitable. Through the National Technical Development Committee, we have been setting up a program of cooperation with the Finns and with a West European university which is trying to make arrangements for the manufacture of our shape-recognition system. As part of our academic cooperation with the East Berlin Institute of Cybernetics, we are also trying out our systems on one of their robots. In addition, we have suggested to Hungarian establishments that they should bring their robots to us, so that we may try to control those as well. Currently, as part of the Hungarian R&D program, discussions are being conducted on how we can make further progress at home. The Rekard factory in Gyor also has some ideas...

We'd like to go to Turin...

[Parody of a line from a Hungarian folk song: "We'd like to go to Debrecen."]
[Question] Decrees, ordinances, and coercion will hardly change the situation. In the meantime we still have the institutional "relay race"--you have to keep running until someone takes over the baton...

The group at our Institute has learned a modern specialty, and learned it at a very respectable level. Our situation is such that we can recognize the leading results achieved in the world--not only those you can see at exhibitions but also, to some extent, what is "cooking in people's heads." We are striving to produce original technical solutions, since this is the only way we can help Hungarian industry manufacture a number of competitive products. We are convinced that in the present economic situation it is precisely the encouragement of research and development that provides the only alternative. Money can be made only with money or with original ideas... Exporting our intellectual products is a short-term and unsatisfactory solution because it means selling the work once instead of selling the results many times. That would enrich others, not us. Enterprises are complaining of lack of money, talking about regulations, and meantime they condemn everything that is really up-to-date as being unfeasible with Hungarian capabilities and Hungarian intellectual sources. And this makes them lack confidence... The path of technology transfer from institutes to enterprises would be smoother if it were made clearer where the interests of the enterprises lie.

[Question] You don't mean that there should be new "indicators" and regulations, do you?

[Answer] It all begins with the fact that so long as someone can sell the less up-to-date product, it is not in his interest to manufacture anything better. It is difficult to start on something new, to explain to the enterprise's own developers that "the party's over," that they have to work harder, and perhaps for a while even with less personal profit. Lump-sum grants of money for starting production also give no incentive for manufacturing, only--at most--for the writing of reports. But if enterprises were given progressively greater preference as their product flow increased, they would understand at once where their interests lie. And today they have a thousand and one reasons to purchase licenses not from SZTAKI but, for example, from the Italians. They get the foreign licenses with state money, and they can even make the gesture of sending their employees not to Kende Street to study but, say to Turin... They receive dollar support only for the purchase of foreign licenses. It is in their interest to have the product include such components from the Western world as will prompt the capitalist firm to buy products from Hungary. We cannot prescribe any equipment or components for our systems except Hungarian ones... At present, in foreign deals, whether concerned with robots or with anything else, enterprises have no interest in reducing development costs, since most of their profits will be taken from them anyway. But just ask a robot manufacturer what he would say if he were told that if he produced even more, he would be exempted from the investment tax or would be given a preference that depended on the number of items produced and increased on a percentage basis...

[Question] Who wouldn't be glad to get any kind of preference...?

[Answer] If it were financially more advantageous to buy Hungarian intellectual products, then the manufacturer would hasten to find out what he can get here at home. In addition, of course, he should also be afforded an opportunity to look around world-wide, because for the most part, he can get to a particular fair only if he buys a license... It is also a relevant consideration that technical decisions are made by so many people that the responsibility is often untraceable. And yet it ought to be entrusted only to those who, after all, do the producing.

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DISTRIBUTION, CONTINUITY OF RESEARCH FUNDS REMAIN UNSATISFACTORY IN HUNGARY

Budapest FIGYELO in Hungarian No 37, 11 Sep 86, pp 1, 6

[Article by Gitta Takacs]

[Text] "Luxury is as much a necessity of life in science as in art. In both of them, the only thing truly worthwhile is what is above the ordinary. Their needs cannot and must not be measured by the normal standards of economical governmental management."

Excerpt from Lorand Eotvos' address on his inauguration as rector, 15 September 1891.

A retired managing director, who also held a high scientific post, told this story. In olden times, after the peasant family had gathered the year's potato crop, the first thing they did was select the most beautiful potatoes for next year's planting, next they put aside the potatoes suitable for baking bread, and only then, if there was still enough, could they eat "paprikas" potatoes. The parable was related at one of those many scientific and economic conferences which discussed the burning questions of research and development. That is to say, they discussed just what was left in Hungary as "potatoes for planting."

A major task of every country's government and economic management is that of deciding how large a research and development base it will maintain and what percentage of the national income it will devote to this purpose. Another subject that must be decided is what should be the proportion of the sums allocated to basic research, applied research, and development and what should be the areas of specialization on which they will concentrate the available financial resources, which in small countries such as ours are always scanty.

The subject of our study this time is basic research. The meaning of this concept is more or less clear to everyone, but it does not have an exact and unambiguous definition that is accepted by all. The definitions given refer mostly to such things as the determination of fundamentally new items of knowledge about the world, the search for new interrelationships, the discovery of the laws that govern reality, and so on. Evaluation is also made more difficult by the fact that each area of specialization

regards different things as basic research; things still assigned to this category by technical specialists are often already called "applied" by physicists. And in the social sciences, some actually question the right of basic research to exist, or more precisely, the right to call any such research "basic."

In our country there are 1,300 research and development facilities, of which 68 are research and development institutes, 934 are advanced educational research centers, 215 are the research facilities of enterprises, and 80 belong to other categories. Two-thirds of basic research is carried on at the Academy's institutes, and such subjects are dealt with chiefly in the subject departments and research groups of universities and other higher educational institutions.

The number of researchers in Hungary is almost 37,000; the "reduced" number is 23,000 (this is the term used in statistics for the data converted to full-time workers, since university teachers spend only part of their time on research). According to estimates, or "self-identifications," 2,500-3,000 of them are "basic researchers."

A decree having the force of law dated March 1986 made the Hungarian Academy of Sciences responsible for the guidance and harmonization of basic research.

The position and appraisal of basic research has changed a great deal over the years. By the beginning of the 1950's Hungary's research network had been established in its full scope, with objectives which were ambitious in every field of specialization according to the policies of those days. The share of research allocated to basic research was a large one, and the Academy's institutions had been given tasks which were almost exclusively connected with this; one result was that they became isolated from practical life and from production, surviving until 1968 solely on budgetary funds.

To the point of drowning

Beginning in 1968, a "new mechanism" was introduced into the research network as well as the economy. Institutions entered into practice and started to earn money and to cover an increasing share of their expenditures from their own earnings. The introduction of so-called contract assignment opened the way to the involvement of enterprise sources. The number of orders grew rapidly, but since these related mostly to the solution of an individual concrete problem, or to the development of a single process, instrument, or technology, the Academy's researchers came to occupy themselves more and more with applied research and development and less and less with basic research. (There was also an increase in the proportion of undertakings which were not very demanding in the scientific sense and did not require a high level of preparation.) All of this is also proved by the Academy's investment data: 2.5 billion forints in 1971-1975, 3.4 billion in 1976-1980, and 2.7 billion in 1981-1985 (at current prices).

Contract work accounted for 24, 31, and 55 percent of these amounts, respectively.

In the opinion of scientific organizers, the ratio was still a healthy one about 1975-1976: at that time basic research received 13-14 percent of R&D allocations. But the retrenchment and de-emphasis in basic research continued. It was not long before researchers were called upon both by enterprises and by the country's economic management to produce results that promised early profits. Yet the time required before basic research produces such results may be 10-15 years.

According to a simile used by a Soviet academician, "Science is like a tree. Basic research is its root, and if the root is not watered, the tree withers." Yet the watering of Hungarian basic research became a thinner and thinner trickle. Its share of investment fell below 10 percent. About 1982, people at the general assemblies of the Academy and at other forums began to ring the alarm bells: the shrinking percentage of basic research would cause a drop in applied research and development within a few years, and ultimately a drop in production. Two years later the alarm bells could be heard far and wide. A number of party and governmental decisions were made on the subject, and today nobody doubts any longer the importance of research, and of basic research within it. In 1984 the government allocated 200 million forints of emergency assistance to basic research, drawing on the reserve fund of the centralized technical development fund. The money was allocated on the basis of competitive applications. The researchers, demonstrating a "healthy spirit of struggle," asked for 2.5 billion forints. No wonder, therefore, that storms raged in scientific opinion concerning the distribution of the money, since after all, the needs to be met amounted to more than ten times the amount available.

"...Hungarian science has at most a reserve of two or three years. If within that time--roughly at the beginning of the next 5-year plan--no change is made, Hungarian science will forever lose its competitive capacity ...," declated Istvan Lang, the present general secretary of the Hungarian Academy of Sciences, in the autumn of 1984.

Another quotation, from the speech delivered at the Academy's 1985 general assembly by Janos Szentagothai, is also relevant:

"It would be a serious mistake for us to believe that by means of technologies purchased from abroad, where they are already obsolescent, and by means of licenses purchased with additional heavy credits we can catch up with the developed part of the world, or even that we can reduce or halt the rapid growth of the technological gap separating us from it. Behind the world's most developed technologies, everywhere and without exception, there stands an effective basic-research infrastructure. We cannot hope for any fundamental change until we ourselves are able to achieve the temperature of the magical self-sustaining chain reactions of modern technologies based on original basic research."

Lifeline

A lifeline was thrown to our drowning basic research in 1986, in the form of the National Sceintific Research Fund (OTKA). This was created by the Science Policy Committee of the Council of Ministers, for the purpose of establishing or improving the necessary conditions for up-to-date original basic research that would be outstanding even by international standards, with a view to giving support primarily to basic research conducted at the Academy's research institutes and at higher educational institutions. A total of 3.8-4 billion forints can be distributed over the period of the Seventh Five-Year Plan; half of this may be allocated to the current expenses of research, and the other half to the development of research infrastructure and the procurement of instruments and computer equipment. Individuals and research teams were allowed to submit applications, and a decision on them was made by mid-July. (A list of winning applications in the field of economics and related sciences was published, among other places, in issue No 32 of FIGYELO for 1986.)

On the basis of multi-level decisions designed to eliminate subjective elements, 761 of the 1,926 applications received were accepted and given a total of 1,545 million forints of current expenses, 400 million forints of investment for instrumentation, and 100 million forints for the development of computer technology. The accepted applications involve 3,600 researchers, that is to say, about 10 percent of all those doing R&D work in Hungary.

The 1,165 applications not accepted may be assigned in equal proportions to the categories of those which could probably be successful but were rejected for lack of funds, those which are of high quality but cannot be considered basic research, and those which, in the committees' opinion, were not likely to produce useful results. A competition for the development of infrastructures, to be announced this autumn, will be aimed at institutions and will distribute 1.4 billion forints. For the remaining few hundred thousand forints, it is expected that a new thematic competition will be announced at the end of 1987.

In order to bring the proportion of basic research up to the desired level of at least 13-14 percent, by the way, it would have been necessary to allocate some 20-21 billion forints during the period of the Seventh Five-Year Plan. When compared to the sources of money available up to now, the OTKA plays merely a supplementary role and represents an addition of about 10 percent.

Competitive applications

Perhaps the most important question for the directors of research facilities is when, from where, how, and in what amount they can get money for the research work done at their establishments. From the multitude of announced competitions it would appear that there are many

sources, but of course, none of them is too copious. There is a research fund associated with the Academy, created out of a percentage deducted from the prices paid to institutions that undertake contractual research and amounting to 250-270 million forints for a period of three years. There are research competitions organized between ministries or in one ministry--the Ministry of Culture and Education, the Ministry of Industry, the Ministry of Health, etc.--and a basic-research topic has also been included among the programs of the National Medium-range Research and Development Plan (OKKFT). From this, 1 billion forints are to be allocated to basic research in biology.

Instead of the former grant system, researchers are now living in the age of the proposal system, the age of competition--so much so that many believe we have already fallen off the other side of the horse, because it is getting more and more difficult to find one's way among the multitude of competitions. There has been a substantial increase in the administration of scientific-organization departments, and as the deputy rector of a university has said, it is not so easy to learn what justifications should be written for what announced result, and when. After all, the same topic is judged from different points of view by the ministry, the Academy, and the OMFB.

An extremely sensitive problem for the directors of research facilities is that of establishing constancy and continuity in research work. The sources of the Sixth Five-Year Plan were exhausted at the end of December, the OTKA contracts are beginning to be signed only about now, and the Ministry of Culture and Education also has waited for the decision on the OTKA competitions before judging the claims at the ministry level. In the meantime three-quarters of a year has passed.

For example, the Faculty of Natural Sciences of the Lorand Eotvos University of Arts and Sciences (ELTE) had to take care of some 80 researchers, laboratory assistants, technicians, and instrument specialists who were working on the earlier research topics and whom the Faculty was paying from the money obtained through its previous successful applications. Should they have started solving the new problems with new people, who were not familiar with the topic and with the surroundings? Fortunately the Faculty of Natural Sciences has its own salary plan: what is left after payment of the monthly salaries may be distributed as rewards at the end of the year. The salaries of the contract employees up to the end of August were debited to this reward item. Some 1 million forints was allocated as credits in this manner, and a new financial maneuver will be required in order to make the salaries trickle back into the truncated reward fund from the money obtained in September on the basis of applications. In the round of applications submitted three years ago there was still a "salary reserve for the faculty which could be formed in the case of contract work," and it was from that reserve that it was possible somehow to fill the "vacuum" created between the applications.

In the expenditures of the Academy's institutes the fraction represented by money from the budget is about 35 percent, which means that they must obtain two-thirds by themselves. (This average conceals large discrepancies between the individual institutes: for example, the Research Institute of Mathematics or the Research Institute of Astronomy lives entirely on budgetary funds, whereas the Central Research Institute of Physics gets 80-85 percent from its own price earnings.) The "interregnum" between the competitions, the turnover point between the 5-year plans (which is the reason for the slower opening of the enterprise channels) is a critical time particularly for the institutions that are heavily dependent on contract assignments--for example, the aforementioned Central Research Institute of Physics.

Immeasurable instrument worries

There has also been a severe drop in the level of research infrastructure, in the degree of instrumentation. The acceptable ratio of gross to net values for equipment and instrumentation in a well-equipped research laboratory is about 60-70 percent, according to research analysts. (This ratio may be regarded as ideal and did exist, for example, 7-8 years ago at the Szeged Biology Center, which was still considered new at the time.) In 1980 the national average was still 53.5 percent. By 1984 the average age of the instruments had increased to 9-10 years, and the ratio of gross to net values had shrunk to 35 percent.

In technologically developed countries the instrument background behind each researcher is $50,000 to $100,000. In Hungary we have some Academy institutes which may well be considered living museums of instruments, with almost all their equipment already depreciated to zero. In many places it has been necessary to work with instruments 25-30 years old, and there is not even a hope for parts to repair them; some of the manufacturers went out of business at least a decade ago. Equipment that is capable of doing more than its predecessors appears on the world market every day. The accuracy, sensitivity, and speed of ten years ago are no longer satisfactory; circumstances have changed. It happens more and more often that respected scientific journals refuse to publish an article by a Hungarian scientist because he is unable, for lack of instruments, to submit sufficiently accurate, reliable, and detailed data with it. No amount of brilliant thinking or mental superiority can make up for a lack of equipment. In addition to all this, there are the minor items in the "miscellaneous" category, such as the radical cutback in subscriptions to journals, which created a sizable storm at the time, or the lengthy and complicated procedure for obtaining chemicals and auxiliary materials for biological and chemical researchers, which is the subject of an investigation being conducted at this very moment by the Central People's Control Committee (KNEB).

Our research infrastructure, would naturally have to include an electronic information exchange system, a computer technology network with document transmission, message dispatching, a patent library, and planning services.

The Academy's existing computer network is contending with hardware limitations, and the birth of a mechanized information system to register Hungarian research topics has been "in labor" for several years.

According to estimates, it would require the periods of at least three 5-year plans--assuming, of course, that appropriate material and intellectual investments are made--to build up a relatively up-to-date instrument pool and research infrastructure.

Pleading for foreign exchange

At the Academy's general assembly last year, Deputy Prime Minister Laszlo Marothy's speech included, among other things, the following: "Our government is striving to ensure that the circumstances of scientific research become more stable, that the operational conditions of basic research are safeguarded against the waves raised by everyday economic problems, that a way is found for the funding and implementation of longer-term plans."

It became easier this year than last year or in earlier years to meet the forint needs of basic research from the funds awarded by the OTKA and other competitively awarded funds, from the budgetary support given to institutions, from their own price income, and the like.

Between 1986 and 1990, according to the Seventh Five-Year Plan, 152-164 billion forints will be allocated to research and development: 33-37 billion will come from the budget, a similar amount from the centralized technological development fund, and the rest--80-85 billion forints--will come from enterprise sources. (Of course, one must be very careful in handling numbers too: last year an Academy committee's survey found that some 17 percent of the budgetary funds allocated to research is paid back into the state treasury in the form of taxes...)

So far as we know, there is no approved medium-term plan for convertible foreign-exchange funds. The possibility of utilizing foreign exchange in any given year depends on the financial equilibrium prevailing at the time.

The foreign-exchange needs of basic research may exceed 30-50 percent in some cases. For the time being, even the problem of foreign exchange to cover the winning OTKA applications has not been solved. (As previously envisaged, 20 percent of OTKA funds would have been convertible foreign exchange.)

Several winning research-project leaders indicated that if they did not receive the foreign exchange they had requested, they would have to return the forints as well, as they would be unable to carry out the research tasks they had undertaken. The day-by-day problems of obtaining foreign exchange, unfortunately, do not spare even the most privileged kinds of research, such as biotechnology.

The years that will bring the answer

There is a great deal of talk nowadays about basic research, chiefly about the new monetary fund. There have been both talk and studies concerning the objectivity of judging the applications--"We are a small country; on any given topic, the applicant and his opponent are either friends or rivals"--concerning the difficulties involved in making the selection (with a certain ironic flavor: "he who has money directs, he who has none coordinates")--concerning the deterioration in the personal conditions of research, with suggestions that fewer young people are interested today in such careers and that the available supply of researchers is growing older and somewhat diluted (need one explain why?)--concerning the extent to which research can be planned and the optimal ratio of competitive to institutional financing (institutional directors and university councils discussed their 1986-1990 plans last year and voted on them, even though they had no idea of what they would receive money for, and how much that money would be)--concerning the measurability of the results of basic research and the recouping of investments--concerning accountability, which is necessary and proper but will have to be determined by methods suitable to the natural history of research, since an accountant-like view is inappropriate here--and we could list a number of other open questions as well.

It is only after a few years have passed that the changes made in the management of scientific research and the effect of introducing the OTKA will be truly evaluable and measurable. Moreover, by reason of its special characteristics, basic research cannot bring other than moral victories. In order to make sure that the energy devoted to basic research and the funds invested in it bring a satisfactorily effective return to the economy, it will be necessary to strengthen the links of the chain that are constituted by applied research, by development, and last but not least by the absorptive capacity of industry.

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SUPPLY OF DOMESTIC, FOREIGN PERSONAL COMPUTERS TO BE COORDINATED IN HUNGARY

Budapest FIGYELO in Hungarian No 37, 11 Sep 86, p 7

[Article by Takacs]

[Text] The domestic supply of professional personal computers and the problems of manufacturing, marketing, imports, and price levels have been dealt with recently by the competent authorities as well as by others. According to information supplied by Gyorgy Sarkozi, chief of main department in the National Material and Price Office, a decision was taken to the effect that the problem of supplying professional personal computers (PPC's) should be solved by harmonizing domestic sources and imports, using IBM-compatible machines, under a unified system of requirements and unified conditions. To this end, in a competition announced by the National Technical Development Committee (OMFB), the National Material and Price Office, and the Ministry of Industry, associations having the status of bodies corporate will be established, with the participants competing against each other. The members of these associations will be chosen from among those foreign-trade, Capital Equipment Marketing Enterprise (TEK), R&D, manufacturing, and service enterprises and institutions which are affected by the import and production of PPC's and of the components, subunits, and peripheral equipment necessary for their production. The domestic market price of PPC's must be vigorously reduced.

The associations engaged in improving the domestic supply of PPC's will naturally make optimal use of imports as well in order to meet market needs. In the interest of avoiding a harmful monopoly situation, the associations will be open, and there will be opportunities for new organizations to become involved in the supply of PPC's where necessary.

More and more people are learning to talk the argot of computer technicians. They hear a salesman say, "We can also give you a 27-megabyte Winchester," and they understand that they can buy magnetic disks that are obtainable only for foreign sources, with a large data-storage capacity, for their personal computers. "It runs on MS-DOS" tells them that the machine has some operational (control) system that qualifies as a world standard, so that it is possible to buy a considerable variety of software and readymade applications programs for it. Those even better versed in the art can also

understand such statements as "you can use dBase III on it," that is to say, a database handling program which can be used for the convenient preparation of warehouse or personnel registers or library information systems.

On the other hand, even among "native-born" computer technicians, very few would dare claim that they can find their way with certainty in the jungle of our domestic microcomputer technology, in which new hardware and software "vegetation," all sorts of associations, small cooperatives, subsidiaries, and specialized stores of various sizes are springing up every day.

Market jungle

The history of microcomputers in Hungary dates back to only five years ago, but during this period, from time to time, there have been changes that excited and often embarrassed the users and potential purchasers of "micros."

Before turning to a discussion of events in chronological order, let us make a distinction between microcomputers designed for household, hobby, game-playing, and school use (for example, Commodore 64 and Sinclair) and professional personal computers--PPC's--which are intended for economic applications. (Household computers were also purchased by Hungarian enterprises in lots of 10,000 or more, and the confusion resulting from this was discussed in issue No 6 of FIGYELO for 1986.) Within the category of PPC's, there are significant differences concealed behind the designations of 8-bit, 16-bit, and 32-bit machines. Doubling the number of bits handled at one time--something that depends on the microprocessor which is the "soul" of the computer--produces a quantum jump in the "cross section" of the information flow, in speed of operation, and in machine performance.

The first 8-bit domestic machines were produced in 1982, and they were followed by newer and newer types cropping up like mushrooms after rain. Besides the companies traditionally engaged in the production of computer technology, a good many institutions whose profiles are entirely different (for example, the Textile Industry Research Institute and a few producer cooperatives) produced their own series, consisting of a few machines, on a "do-it-yourself" basis. Compatability of these machines, low price, and standard software were out of the question. Only one or two of all these series ever got beyond the level of hundreds of units--for example, types MO8X and Proper 8 produced by the Computer Technology Coordinating Institute. In late 1982 and early 1983 they were still selling for about 1 million forints. In the spring of 1985 the price was 750,000 forints, and by now the market price has dropped below 250,000, since their production has been discontinued.

We have now arrived, even inside Hungary, at the age of 16-bit machines, whose price--to quote the expression used by a market-analysis specialist--"crashed down on top of the 8-bit machines and killed them." A milestone came in 1981 with the appearance of IBM personal computers, because this type of machine became a sort of unofficial world standard both in hardware and in software, and Hungarian manufacturers too accepted it as their "fundamental type." Since then, IBM has continued to expand its PC family with the introduction of newer and higher-performance models. The PC-XT includes a hard-disk (Winchester) storage unit, and the AT is a product that gives much higher performance and is constructed on a more up-to-date microelectronic component base. The price of the original IBM PC's is a good deal higher both in Hungary and on the world market than that of compatible types. The purchaser pays for IBM's better service, such as its excellent repair arrangements, component supply, and software maintenance.

The first IBM-PC-compatible machine in Hungary was the Proper 16, introduced by the Computer Technology Coordinating Institute (SZKI) in the summer of 1983. Since that time, they have sold machines on the socialist market as well, with more than 50 type designations. Among the many domestic types, the best known and most widespread are the aforementioned Proper 16, the Varyter XT produced by the Computer Technology and Automation Research Institute, Videoton's VT 16, and the MXT and MAT machines produced by Muszertechnika Kisszovetkezet.

The year 1985 marked a turning point for the domestic PPC market: in addition to a number of domestic types, there also appeared imports from the Far East (Taiwan, Hong Kong). The growth of a buyer's market led to a radical drop in prices, amounting to about 50 percent in a few steps. To mention only two examples taken at random, the price of MXT computers dropped from 420,000 forints in December to 190,000 in May, while the price of a Proper 16, which had been 800,000 forints in 1983, dropped to 650,000 in June 1985 and to just 489,000 in December 1985.

The list of marketers has also grown significantly. The newcomers are offering chiefly types obtained from the Far East or machines assembled in Hungary from imported Far Eastern component packages.

IBM-compatible machines are being produced at a fairly large number of locations in Hungary. I have deliberately avoided writing that they are being manufactured there, because this would be true of only one or two enterprises and cooperatives, while the others restrict their activities mainly to assembly based on the import of subunits. The most diverse sources of foreign exchange are being used for these imports--for example, compensation transactions, for which a counterpart can be provided by software exports as well as by soft drinks, have been used to import component packages in small quantities. And a good many people will probably still remember an advertisement from a small cooperative which read: "Attention, all those with foreign-exchange accounts! We will pay cash for the industrial items we need." By industrial items they meant

chiefly computer accessories... Channels like these, which are difficult or impossible to monitor, constituted the background of small-scale PRC manufacture at some two dozen enterprises engaged in operations of various kinds.

The price of PPC's, incidentally, has varied over a fairly wide range during the past months. If we study a June price list, for example, we find that original IBM PC-XT computers were available for 690,000 forints from Ramovill and for 1.2 million forints from the Photoelectronic Cooperative (Fotoelektronik Szovetkezet), while the price of XT-compatible machines ranged from 290,000 forints to about 700,000. The sensation of the market, however, was by all odds the AT-compatible machine imported from Taiwan by Elektromodul and sold for 182,000 forints! Of course, there were only 100 computers available, for those lucky ones who got the "inside dope" early enough. This machine was nearly 1 million forints cheaper than machines with similar performance which were being offered elsewhere at the same time. Elektromodul is accepting advance orders, and according to our information, they have already received more than 4,000. A survey taken in the spring found that by the end of the Seventh Five-Year Plan there will be a need for about 8,000 professional personal computers. This field of specialization is likely to make fools of the prophets this time too, as it has so often done in the past.

There must be no monopolies

At the end of 1985 there were 17,000 microcomputers being used by economic organizations. Only 30-40 [sic] of these were PPC's, including about 1,500 each in the 8-bit and 16-bit categories and several dozen 32-bit machines. If we take account of the rate at which the number of machines is growing, doubling every year, we can estimate their present number at some 25-30,000. The proportion of professional equipment has undoubtedly increased significantly, since commercial experience indicates that public institutions have been purchasing only this kind since the end of last year.

IBM's 32-bit machine, the PC-RT, was introduced in January of this year, with an Intel 80386 microprocessor as its basis, thus once again prescribing the path of development to be followed by the world's manufacturers. A number of types have been produced in Hungary as well, at the workshops of the SZKI, Videoton, and the Instrument Technology Small Cooperative (Muszertechnika Kisszovetkezet). Thus far they are being used in Hungary only at a few scattered locations, the outlines of the market are slow in taking shape, and because of their high price they are finding only a limited demand among those able to pay. According to some expert opinion, another reason they will find it difficult to make a breakthrough in Hungary is that the needs of domestic small- and medium-sized enterprises are satisfactorily being met by the much cheaper IBM-compatible types.

Of last year's 1,500 16-bit machines about 900 were domestic products, 600 of them produced by the SZKI and 200 by the Instrument Technology Small Cooperative. Many people will no doubt wonder why Videoton, which traditionally has a large capacity for the production of computer technology has not come out on the domestic market with mass-produced cheap PPC's. The reason this enterprise did not have an incentive for doing so until now was the method of calculating the expenses that could be allocated for this purpose. Recently, however, Videoton was granted an exemption from including in its allocation the PPC's it sells on the domestic market.

As a realistic requirement, we can hardly expect Hungary's PPC manufacturing industry to be able to compete with the dumping prices of the Far East. On the other hand, the development of a personal-computer culture--including manufacture and applications--is important, since we have not enough foreign exchange to cover all our needs with imported machines and since from the standpoint of automation, microprocessor machine systems, instruments, new-type telecommunications services, and the like, understanding and utilizing PPC's is decisive.

In recent weeks those interested in the domestic personal-computer market have devoted a great deal of attention to the competition announced by the OMFB, the National Material and Price Office, and the Ministry of Industry for the establishment of associations to mass-produce and market PPC's. Reports are springing up from time to time in specialized circles as to which enterprise or cooperative is competing for which role and what capacity it has for this, who is unwilling to work together with whom, and who is willing...; the applications must be submitted by September 20. Beyond question, the evolution or deliberate organizing of any kind of monopoly would be particulary harmful in this field of production.

Competition promotes the improvement of supply and services and the reduction of price levels. A decision concerning the new cast of characters in the "drama" which thus far has had so many actors and no director may be expected at the end of the month.

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UNICAMP RESEARCH IN BIOTECHNOLOGY

Sao Paulo FOLHA DE SAO PAULO in Portuguese 10 Oct 86 p 26

[Text] Yesterday afternoon, the State University of Campinas (UNICAMP) formally purchased the country's largest research complex in the fields of biochemistry and agricultural biotechnology. This is the Agricultural Research Center of Monsanto Industries of Brazil, located 4 kilometers from the university campus in Campinas (92 kilometers northwest of Sao Paulo). According to Dean Paulo Renato Costa Souza, aged 43, this acquisition, which involves an investment of about $3 million (or about 40 million cruzados), initiates the process of reoutfitting UNICAMP and will benefit research in chemistry and biotechnology.

The contract is scheduled to be signed within 15 days, since the process of inventorying the equipment and the land title search are still in progress. The real estates includes a 36-hectare area of farm land and 4,000 square meters of improvements, including laboratories, pilot plant, hothouses and greenhouses. According to George F. Clegg, 55, president of Monsanto Industries of Brazil, the center was purchased for about two-thirds of its real value, which was made possible through an agreement by which, for 5 years, the company will continue to exploit a 6-hectare area in the sector dedicated to farming.

The purchase of the center is being financed by the State Bank of Sao Paulo (BANESCO), with the approval of the state government. UNICAMP will amortize the loan by including the payments in the institution's future budgets. According to the dean, it would take UNICAMP about 5 years to build and equip a center of this size and it would cost about $10 million, at current values.

The Monsanto Center had been inactive since January. According to Clegg, Monsanto was concentrating its research in Sao Jose dos Campos, in the Vale do Paraiba. Moreover, the company, which is headquartered in Missouri (central region of the United States), has a large program of investments in chemicals and products which do not yet exist on the Brazilian market; the program will involve about $40 million and part of the proceeds of the sale will be used to finance it.

UNICAMP Research

Once the contracts are signed, UNICAMP will designate the center as the Multidisciplinary Research Center for Biological and Biochemical Research. According to Paulo Renato, "the center will play an integral part in the nation's

research effort in the area of biotechnology and will be in the nature of a national center." The use and management of the center have not yet been determined, since the transaction between UNICAMP and Monsanto was only approved by the Directive Council on 30 September.

A committee comprising directors and docents of the Biological and Chemical institutes and the faculties of Engineering, Nutrition, Agricultural Engineering and Chemistry will draft the regulations establishing a scheme of organization, use and work. The dean said it would take about 50 specialized personnel to run the center, which will require annual investments of 6 million cruzados, including maintenance and salaries. Resources of this order have already been allocated in the 1987 budget, which will permit the center to go into operation as soon as the contract is signed.

On its 36 hectares of farm land, the center has the necessary infras ru tures fof irrigation. The improvements include chemical laboratories, already equipped, and a phytotron chamber to create artificial climates, simulating temperatures, light conditions, humidity, plant nutrition and irrigation. There is also a pilot plant for testing products developed on a commercial scale.

6362
CSO: 3699/39

BRAZILIAN BIOTECHNOLOGY FIRM SEEKS TO EXPAND

Rio de Janeiro O GLOBO in Portugueee 6 Jan 87 p 19

[Text] Belo Horizonte--One of the first companies in Brazil devoted to biotechnology--Bioferm, a subsidiary of Biobras--is seeking associates to participate in its expansion plan, which will permit ground-breaking activity in the private sector: the provision of services in research and development of technological processes in the area of biotechnology.

According to Marcos Mares Guia, general director of Bioferm, the decision to invite the participation of new business groups is a result of the success of the firm, created to develop technological processes for Biobras.

For the expansion plan, the company must attract from $1. 5 million to $22.5 million (22.64 million cruzados to 339.72 million cruzados) [figures as published] to expand Bioferm's activities. According to Guia, the entry of new associates has already been cleared with FINEP [Funding Authority for Studies and Projects], which holds a 38-percent interest in the company.

For 2 to 3 years, which Mares Guia considers an ideal period to demonstrate the viability of Bioferm in its new dimension, Bioferm will continue to hold a majority interest, possibly with 51 percent of the capital. After this phase, the company plans to go public. Guia said that, by February, he hoped to have reached agreements with some of the financial greups that have already expressed an interest.

The new resources are needed for the continuity of the company's research projects, including the development of products for diagnosis of human diseases, in a later phase. Meanwhile, Bioferm will continue to do research for Biobras, under service contracts.

6362
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ARGENTINA SEEKS WAYS TO PROTECT DOMESTIC SCIENCE AND TECHNOLOGY

Buenos Aires INFORME INDUSTRIAL in Spanish Aug-Sep 86 pp 54-55

[Article by Andrea Turchi]

[Text] While the executive is to send to parliament a bill on technology transfer, the science and technology committee of the chamber of deputies is now considering three initiatives on this topic, which is of particular importance for Argentina's economic development.

One of these bills--which is being cosponsored by deputies Jose P. Aramburu, Oscar E. Alende, Raul O. Rabanaque, Isidro R. Bakirdjian, Marcelo M. Arabolaza and Miguel P. Monserrat of the Intransigent Party--states that it is necessary "to close the gap separating us from the developed countries," but without retracing "the routes they have followed, for they have different situations and different potential"; the bill says it is vital "to create the conditions so that our country will be able to master the technology we need for our own future developments."

In addition, the bill states that it is inevitable that dependence will grow even worse "if technology transfer is done without an independent policy, without a legal framework for the protection and promotion of national technology, and without taking into account the needs and priorities of the environment into which this technology is being placed."

The Intransigent Party's bill calls for the approval of a legal framework which would block transfer actions which are "harmful to the national interests or contrary to national plans, a legal framework which will help to ensure favorable terms for the technology recipient, and fundamentally for the enhancement of our own technological development."

According to deputies Eduardo P. Vaca, Alberto S. Melon and Juan C. Barbeito, who introduced the Justicialist Party's alternative, during the past "two decades the role of technology as a factor of production, its guiding effects on economic and social development, and its cultural impact have moved to the center of international debate." They maintain that as the relatively less developed countries begin to grasp the problems raised by this issue, a

number of them are starting to undertake actions whose objective is self-determination in technological matters, handling both aspects of development and the acquisition of knowledge from outside."

The Justicialist legislators point to their bill 20.794--passed in 1974--"as an event of fundamental importance, through the qualitative advance it represented, the depth of the debates, and the high level of consensus reached in its passage," and they noted that under the laws put into effect under the military regime, "there was found to be an almost 10-fold increase in money leaving Argentina for royalty payments between 1977 and 1983; this was paradoxically accompanied by a notable decline in gross domestic product, especially in the manufacturing sector."

They are supporting their bill with this background; they maintain that "it is of vital importance to submit for national debate the conditions, special features and characteristics of technology imports, believing that this forms part of the problem of technological development as a whole," and "given the need for a technology marketing law that is appropriate for our situation and needs at this historic moment in time."

The fundamental objective of the transfer bill introduced by the Radical Party deputies Hugo A. Socchi and Juan Jose Cavallari is "to achieve national autonomy in technological development, by selective access in favorable conditions to the fruits of the contemporary technological revolution and their effective absorption by our national productive sector."

The Radical Party's bill cites the experience of countries like Spain, Portugal, South Korea, the Philippines, India and Japan as evidence that "state participation in the regulation of the technology import market not only helps to reduce the explicit or implicit costs of technology imports, but also helps to increase the capacity of the recipient firms both to negotiate contracts and also to absorb and adapt the technologies acquired." In this bill, they say that, according to studies done by UNCTAD [United Nations Conference on Trade and Development] and UNIDO [United Nations Industrial Development Organization], "prices and contract durations can be reduced to reasonable levels, and many of the restrictive clauses frequently found in these contracts can be eliminated, without thereby impeding the flow of new technologies to the importing countries."

Agreements and Differences

Concerning the range of application of the future law, the three bills agree that it should be implemented in legal transactions by virtue of which individuals or companies with residence or domicile in Argentina would receive from their counterparts abroad, the transfer of rights or concession of operating licenses for industrial property rights; the transfer of technical skills required for the manufacture of products or the supply of services; and the provision of technical assistance or advisory and technical services.

The Radical and Justicialist bills include in this listing the granting of licenses and transfer or lease of computer programs, and extend the legislation to cover cases in which the supplying party resides or is domiciled in Argentina and serves as an intermediary for or on behalf of individuals or companies located abroad, or if the technology or industrial property rights are foreign.

All the bills state explicitly that the authority responsible for application of the regulations may refuse approval of the transactions when: the technology to be acquired "would be contrary to the objectives of national policies or plans in the area of technology or development"; the technology to be introduced is on a level that can be obtained in Argentina; the adaptation of the acquisitions to local conditions is hindered or restrictions are set up on the production capacity and use of quality controls, or specific brands are stipulated. On this topic, the deputies Vaca, Melon, and Barbeito specify in one of the articles of their bill that the authority responsible for application "will reject approval of transactions which have as their sole purpose the licensing of brands, except when the recipient can demonstrate their benefits for the commercial and technological development of the recipient enterprise."

According to article 14 of the PI [Intransigent Party] bill, the authority responsible for application will refuse approval of legal transactions whose purpose is the acquisition of rights or licenses for use or operation, whether or not they also include technology transfer, with the exception of those in which:

a. The granting of the use or operation of brands will be free;

b. Not free, but the licensing party pledges to grant the licenses making possible the use of the product to other countries, and agrees that it would not be used in the national market or the price to be paid will be fixed at a percentage of the estimated foreign currency balance entering the country as a result of the use of the brands, with the express reservation that no sum will be paid if the export operations do not take place.

The bills also call for invalidating transactions in cases in which the knowledge or resolution of opinions is submitted to foreign courts, "which may arise through the interpretation of or execution of these transactions, agreements or contracts, which are to be governed by Argentine laws, and in which the appropriate courts will have jurisdiction."

Another cause for disapproval of the contract would arise if, for the payments to be made, amounts net of taxes are stipulated, when in the supplier's country of residence these taxes are treated as a tax credit.

On the subject of the duration and renewal of contracts, the Intransigent Party's bill proposes that "approval of the transactions be denied when durations longer than 5 years are established," and adds that "this term may be reduced when reasons related to the foreseeable obsolescence of the licensed technology warrant it." In its article 9, the Radical Party's bill sets the duration of such transactions at the amount of time necessary "for the absorption of the technology," and specifies that "renewals shall not be authorized, except in unusual cases because of technological changes which the recipient of the technology would not be able to obtain or develop locally." It also states that "if there is no shorter term set, the recipient's obligations relative to industrial property rights licenses will end at the term or expiration of such rights."

Guarantees and Authorities

Among the required guarantees for the licensee which these bills impose on the supplying firms or enterprises, we will mention those which provide that the content of the technology must be total and complete; the requirement that the recipient must be informed of all improvements and technical advances, and of completing the supply of goods and services and the training of Argentine personnel in the assimilation and handling of the technology. In addition, it states that sales prices will not be higher than those of the international market, and in cases in which agreements are made to sell under license to the supplier of the technology, the prices of the items produced by the licensee will not be lower than prices current in that market.

Nor may the contracts include restrictive clauses which would force the recipient to acquire raw materials, capital goods or services of a specific origin; that set limits on the export of the products manufactured using the technology transferred; or which restrict the recipient's right to question or dispute the validity of the industrial property rights.

Both the Radical and Justicialist bills list the department of industry and foreign trade as the authority responsible for application, through a national commission on technology transfer and a national commission on licensing contracts and technology transfer, respectively; the Intransigent bill proposes that the ministry of the economy be designated the authority responsible for application, acting through the National Technology Transfer Registry.

The functions proposed for the three bodies are similar and include the following, as well as some others: proposing to the executive authorities the regulatory and national policy measures it feels appropriate for this area; the issuing of instructions; the issuing of decisions; and the application of sanctions.

Technology Transfer: Contracts approved and/or registered, amounts due and/or paid (in millions of dollars)

Year	Contracts approved and/or registered (1)	Amounts due and/or paid (2)	Amounts estimated by the INTI (1)
1975	111	64.1	54.4
1976	116	37.6	32.0
1977	116	51.4	34.9
1978	323	148.2	157.0
1979	510	156.7	321.0
1980	495	239.2	581.0
1981	528	246.9	579.0
1982	296	361.1	182.0
1983	322	483.9	238.0
1984	367	675.5 (3)	148.9
1985	436	341.3 (4)	305.9

1. National Institute of Industrial Technology
2. Central Bank of the Argentine Republic
3. For royalties: $445.6 million
4. For royalties: $220 million

Data covering the first half of 1985.

7679
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ARGENTINA MAY NOT OPEN COMPUTER MARKET TO COMPETITION

Buenos Aires INFORME INDUSTRIAL in Spanish Oct-Nov 86 p 57

[Text] The undersecretary for computer systems and development, Dr Carlos M. Correa, speaking of the possible inclusion of computer, engineering, consulting, and software services under the GATT [General Agreement on Tariffs and Trade]--has warned that "this will have a negative impact on the developing countries."

In this official's view, "the growing internationalization of services, combined with the advance in office automation systems, threatens to cut the developing countries off from participation in one of the most important sectors of today's economy. It is not surprising that a country like the United States, which controls 70 percent of the computer hardware and software markets, would advocate the liberalization of trade in computer systems and telecommunications."

Correa feels that the inclusion of high-tech services in the GATT would practically force the developing countries to dismantle their national purchasing systems and other development policies. "That would definitely further the industrial and technological supremacy of just a few of the industrialized countries."

"In the plan that the industrialized countries are advocating, formal equality will promote one of the most blatant north-south asymmetries in contemporary history. The most powerful countries could establish rules they will not follow when it does not suit their interests, as happens now in agricultural trade."

For this reason, the undersecretary for computer systems and development feels it is necessary to examine in depth and well in advance strategies which the region will have to adopt if it is not to remain forever doomed to being a passive consumer of high-tech goods and services; for example, how to determine long-term implications of decisions made on these issues.

7679
CSO: 3699/49

ADMINISTRATION AIDS RESEARCH IN ROBOTICS

Buenos Aires BOLETIN DE LA SECRETARIA DE CIENCIA Y TECHNOLOGIA in Spanish Aug 86 pp 35-36

[Text] Research and Development in Robotics

With the support of the department of science and technology, research and development projects on various aspects of robotics and industrial automation have begun. These projects are designed to introduce in Argentina areas of technology that could have a decisive influence on the creation of new industrial processes.

Two projects will be carried out under the National Computer Systems and Electronics Program; they will be handled by research centers in various parts of Argentina, primarily in Cordoba (National Technological University) and San Juan (National University of San Juan). The topics to be covered include: digital control systems for machine tools and industrial processes, automated equipment for chemical uses, control of factory milling circuits for use with minerals, and flexible control of a robotic handling device.

Technical Standards for Computers and Electronics

The department of computer systems and development has initiated an exploratory study on the generation, application and use of technical standards related to electronics.

The study's purpose is to improve understanding of technical standards and to help to design policies to be carried out by the National Computer Systems and Electronics Program, in order to create or promote technical standards related to computers and electronics.

In addition, the department is considering the possible application of the OSI [Open System Interconnection] standard in state contracting, in order to ensure compatibility between different brands of equipment.

7679
CSO: 3699/49

STATE OF ARTIFICIAL INTELLIGENCE IN BRAZIL

Rio de Janeiro DATA NEWS in Portuguese 11 Nov 86 p 26

[Article by Jussara Maturo; first paragraph is DATA NEWS introduction]

[Text] The country is taking its first timid steps in the area of artificial intelligence. Research projects are gradually being turned into finished products and some contracts have already been signed. However, at the first Regional Meeting on Artificial Intelligence, it was determined that the sector does not yet have a development policy.

Sao Paulo-- Brazilian research in artificial intelligence is attempting to break out of the universities and reach the market. It faces, however, a shy market, in view of the few practical results obtained to date, but the optimism of specialists in this field should be noted.

Brazil has, albeit slowly, taken some important steps. There are two companies now in the market specializing in artificial intelligence: Biosapiens and Tecsis Informatica. Sid Informatic also believes in this sector, since it has invested in the creation of its own research group and in agreements with universities to expand Projeto Estra (Advanced Work Stations). At another level is Digital Equipment Corp, which has not escaped problems with its plans to create centers devoted to artificial intelligence in Brazil, such as exist in other countries.

The results in the foreign market are the primary incentive for the community to attempt more significant leaps. After all, the United States had some 27 hardware and software firms involved with artificial intelligence in 1985 and by 1986 this number had risen to 56. According to Emmanuel Passos, technical director of Tecsis and coordinator of postgraduate studies in computer technology at the Military Institute of Engineering (IME), this growth was spurred primarily by the sale of specialized systems.

Caution

"In Brazil, there are still reservations about adopting this strategy," Passos said. The Brazilian researchers are engaged today in showing the computer community that the specialised systems help to simplify solutions to old problems. According to Passos, one of the principal commercial problems with artificial intelligence is directly related to the high cost of the projected software.

"The market does not yet offer any guarantee of a return on the investment."

Passos feels, however, that this vision will gradually change. His optimism is based on the performance of Tecsis, which was created at the beginning of this year and which, in the beginning, marketed research conducted in the IME. Studies are already underway for the creation of a specialized system for the financial area of the National Development Bank (BNDS). The contract should be signed in 1987, but before then the company will set up a prototype based on information supplied by the bank technicians. The project, for an 18-month period, has been budgeted at 1.6 billion cruzados.

There is also a contract with Burroughs for development of an Se [specialized system] for medical monitoring, with delivery of the prototype scheduled for November. The program would use the Burroughs equipment by Dataprev. Another project provides for work with civil engineering companies to develop an Se to superintend and monitor construction works.

Future

At long range Sid also plans to become a supplier, with artifical intelligence products are the basic component of its line. Before then, however, it intends to create its research nucleus to absorb the artificial intelligence technology in the development of new generations of products. It was with this prospect that the Estra project was conceived, considered the basis for the computer of the future.

"Each class of user will have equipment suited to its needs, and artificial intelligence will be the means to develop these sophisticated machines, based on intelligent systems," explained Sid research technician Nizam Omar. According to Omar, the new computer will accept commands in natural languages, as well as specialized systems in each professional area.

Today, Sid's internal research group comprises four research technicians. Since June 1986, the company has already signed agreements with nine institutions: Puc-RJ [Pontifical Catholic University of Rio de Janeiro], UNICAMP [University of Campinas], Poli-USP [Sao Paulo Polytechnical University], UFMG [Federal University of Minas Gerais], ITA [Institute of Aeronautical Technology (Sao Paulo)], UFRS [Federal University of Rio Grande do Sul], UFSC [Federal University of Santa Catarina], UFRJ [Federal University of Rio de Janeiro] and IPT [Institute of Technological Research]. "They were selected because their research fitted with Sid's objectives," Omar said. Basically, the laboratories are devoted to developing specialized systems, intelligent data bank systems and artificial intelligence languages.

In terms of the universities alone, the project was budgeted at 12 million cruzados. The first results are expected in the next 5 years. "With AI, Brazil has a unique opportunity to prepare itself to participate in the next technological revolution," the researcher predicted.

Partner

DEC [Digital Equipment Corp] is already studying the needs and Brazilian market conditions for the establishment of centers with competence in artificial

intelligence in Rio de Janeiro and Sao Paulo. This proposal has already been taken up with the SEI [Special Secretariat of Informatics] and is still under discussion, since it depends primarily on the importation of DEC work stations. The idea is to develop prototypes of specialized systems in partnership with the Brazilian research centers.

"Most clients want guarantees to invest in projects of this nature; hence the need to create prototypes," said Guillermo Fierro, DEC's software manager. If the proposal is approved, one of the first programs should be the development of a specialized system for planning and control of production in the manufacturing industry. "This type of system has application in Brazil, a country which typically exports manufactured products."

It would be a system of the ISA type used by DEC itself in its 36 plants spread out through the world. "The program serves as an intelligent planning aid, recording orders and distributing production tasks to each plant in a balanced way."

According to Fierro, Digital's experience with AI is of long standing, since the manufacturer already has about 40 specialized systems for its own internal use. Principal among these is Xcom. With 15,000 commands, updated monthly, this system is installed in the production line to control all the configurations to be produced. The program has been in use since 1981 and, according to Fierro, brings DEC a guaranteed return of $20 million.

6362
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U.S. FIRMS INCREASE STAKES IN BRAZIL DESPITE PROTECTIONISM

IBM Software Exports Announced

Rio de Janeiro O GLOBO in Portuguese 20 Nov 86 p 34

[Text] Yesterday, SCI Informatica [Computer] announced an agreement for marketing and technological development in Brazil of a package of computer programs directed toward the Vax line (of the U.S. firm, Digital, produced in the country by Elebra) from MSA, the largest American software company for IBM equipment in the world. The contract also calls for the exporting of the Vax version system to the 50 countries in which MSA operates. The president of SCI, Carlos Valdesuso, is awaiting the go-ahead from the National Institute of Industrial Property's (INPI) Special Computer Secretariat (SEI) by the end of December.

MSA is concluding this type of contract with another firm, outside the United States, for the first time, and the company's vice president, Kerry A. Frederick, came to Brazil especially to handle the paperwork. He commented: "We want to operate within the bounds of the Law on Computers, and the agreement with SCI offers Brazilians a great opportunity to sell what has the latest software technology from the United States on both the domestic and foreign markets."

With 2,300 employees, MSA invests 20 percent of its annual billing ($150 million) in software research and development. Frederick thinks that SCI will be able to benefit from the results, by carrying in Brazil the systems developed by MSA for other machines. He is of the opinion that there are but few base programs for the Digital and Hewlett Packard lines, while the market of those companies is tending to expand increasingly. In the United States, Digital alone has a supply of 30,000 Vax machines.

The MSA package contains 17 manufacturing, financing, and administrative projects for minicomputers. SCI will invest $1 million (14.1 million cruzados) in the Vax version of the MSA system, which should be ready within 2 to 4 years, "depending on our speed," claims SCI vice president Luis Carlos Siqueira.

Despite the pressure exerted by the U.S. Government for American firms to negotiate technology with Brazil, in retaliation against the Law on Computers,

MSA's Frederick disclosed that he has not received any type of restriction for operating jointly with SCI. He added that he would not know how to react if there were any order running counter to the agreement, because he is used to operating in his country based on laws passed by Congress and, in the case of AT&T (which was prevented from transferring the Unix operational system technology to Brazil), there is no legislation on the subject.

In addition to the Vax version, SCI is seeking a partner for the development of Unix for national machines. Siqueira did not preclude the possibility of also using similar versions (Unix-like), "even native ones," in the event that he fails to procure the product dealing with AT&T itself.

"We shall only develop products with guaranteed sale, of equipment produced in Brazil and abroad. It makes no sense to make an electric iron with 78 voltage, without the possibility of being used on locations with 220, such as Europe, or 110, such as Brazil and the United States."

1987 Investment Plans Detailed

Rio de Janeiro DATA NEWS in Portuguese 11 Nov 86 p 6

[Article by Fernando Pereira: "Despite Everything, the Multinationals Are Investing"]

[Text] Rio de Janeiro--The multinational companies in the computer sector will maintain or even expand their investments in Brazil. Despite the nationalist sentiment fostered almost unanimously by politicians during the electoral period, and the possibility that the National Constituent Assembly may adopt that tendency and that a strain might occur in the trade relations between Brazil and the United States, companies like IBM and Burroughs, the leading two in the sector, are expected to invest $200 million in the country next year.

Burroughs director George Herz remarks: "We intend to double our investments in Brazil. This year, we spent $25 million; in 1987, we shall double it to $50 million. Most of these funds are generated in the country, but there is also new capital entering. The largest amount will be allocated to purchase new equipment for our factory in Veleiros (Sao Paulo), where we produce our equipment. There are also investments in imports of computers for sale and leasing in Brazil."

Competition

The computer multinationals' investments should be quite diversified. Nearly all the companies are attempting to apply them in their marketing area, preparing for an increase in competition. All these manufacturers are mindful of the fact that, within 4 years, Brazil will be the fifth-ranking conputer market in the world, and cite the possibility that the current market reserve protecting small-sized equipment will be technologically surpassed during that same period.

Digital Equipment also intends to make investments. Its efforts will be concentrated on the marketing field, with a restructuring in the sales area and more spending on advertising. Investments will be made in the technical assistance rendered by the company.

Reorganization

Although without specifying amounts of funds, two other major computer firms, Hewlett Packard and Control Data, are also anticipating new investments in Brazil next year. They are currently revamping their structures and redirecting their operating lines. According to Luiz Pitanga, advisor to the board of directors, HP is engaged in the creation of Tesis, a national company controlled by the Iochpe group, involved in the manufacture of superminis, with its technology.

Another group that is changing its method of activity in the country is Control Data. After concluding contracts with Moddata (for nationalizing the manufacture of the 830 line computers), Vilares (for transfer of CAD-CAM technology), and Elebra (for Winchester disk units), Control Data is exploring the possibility of turning over the administration of its Cyber bit to Moddata, keeping its sales office for imported, large-sized computers (the 840, 850, and 860 lines, main-frames incorporating Eta-10 technology) in Brazil.

At present, Control Data is offering national companies the technology for the manufacture of laser drives, a product that it has incorporated into its holdings with the formation of a joint venture between its main offices and the Phillips group. Overseas System, a Phillips/Cdc company, has a laser disk unit with a storage capacity of 2 billion bytes on a single side, the technology for which may be turned over to a national firm.

Presence.

While these two groups are seeking associations with national companies to expand their presence on the Brazilian market, IBM, the leading firm, after becoming associated with the Gerdau group, decided to invest $150 million next year. Much of these funds will be applied to the new production line involving large-capacity disk units, in which it intends to invest $70 million in 2 years.

An internal company memorandum regarding this matter states: "IBM's major concern is for an increase in the nationalization index for its equipment, and the transfer of a higher level of technology to the Brazilian market." It adds: "IBM's investments in Brazil take into account a long-term strategy, and are not dictated by temporary situations."

Pessimism in FIESP Poll

The Sao Paulo State Federation of Industries [FIESP] took a poll among over 500 native and foreign industries regarding their investments plans for the 3-year period 1986-89. Generally speaking, most of the firms claimed that they were not motivated for large-scale applications in 1987. The director of the

Federation's economic department, Walter Sacca, was more thorough: he declared that the decline in the investments of foreign companies has been disturbing FIESP, and blamed "a kind of xenophobia that is hurting the attraction of capital from abroad."

Besides that sentiment, in the convocation of the National Constituent Assembly Sacca identifies another factor discouraging multinational executives. These entrepreneurs may be waiting for the features of the new National Congress to be defined, so as later to reposition their companies. The FIESP director mentioned only three multinationals: Siemens ($100 million as of the end of 1987), Monsanto ($40 million for the same period), and Bayer ($150 million for the next 5 years), as companies that intend to invest.

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BRAZILIAN TRADE COOPERATION WITH CUBA IN COMPUTERS

Computer-Related Technology

Rio de Janeiro DATA NEWS in Portuguese 28 Oct 86 pp 8,9

[Article by Fernando Pereira; first paragraph is DATA NEWS introduction]

[Text] The Cuban Government is interested in importing Brazilian peripherals and software for agroindustrial application. It also wants to import technology and does not rule out joint ventures between Cuban state companies and Brazilian private or state companies. Two missions are now traveling to Cuba.

Rio de Janeiro--Peripherals in general and applied software for the automation of agroindustrial operations are two types of products in the computer area which the Cuban Government is interested in importing from Brazil. The information comes from Idelso Espinosa, first secretary of the Cuban Embassy, who organized the visit by Cuban Foreign Trade Minister Ricardo Cabrizas to Brazil last week. On that occasion, Cabrizas estimated an initial volume of trade between Brazil and Cuba at about $100 million in the first 12 months.

At the end of this month, two Brazilian trade missions will go to Cuba. One of them is promoted by the National Confederation of Industry; it is of an institutional nature and some large companies are participating in it. This mission does not aim to reach firm contracts, but it could include a representative of the computer area, Cobra-Computadores e Sistemas Brasileiros, among the firms.

The other mission, which will go earlier, at the end of this week, is sponsored by FLUPEME (Rio de Janeiro State Small and Medium Business Association), whose president is a businessman in the computer field: Benito Diaz Peret, former president of Assespro. In addition to Peret's firm, Apoio, this more pragmatic group includes EBC - Empresa Brasileira de Computadores (micros), Sistema Automacao Industrial (printers and saccharimeters for the sugar industry) and Ts Telecomunicacoes e Sistemas (cables), in addition to 60 other small Rio de Janeiro microcompanies in other areas.

Contacts

The Cubans' first contact with the Brazilian computer industry was at the last SUCESU [Subsidiary Computer Equipment Users Association] fair, held in Rio de

Janeiro. On that occasion, a group of Cuban technicians made several contacts with software manufacturers and firms, but no contracts were concluded. Jane Pinho, responsible for the international area of the Special Secretariat for the Computer Area, had no opportunity for lengthier contacts with these technicians, given the wealth of information which they preferred to obtain directly from the displays at the fair.

The FLUPEME mission intends to have a location at the Havana International Fair, which will be held from 1 to 7 November and in which companies from other countries will participate. "Our idea is really to reach some contract," Peret said. "In the Cuban economy, as we all know, the state is a very large participant, and this obviously makes things easier for us. We plan to sign turn-key contracts. The equipment will be maintained by Cuban government enterprises, to which we will hand over the entire technical package. At the moment, we are not in a position to maintain a more constant relationship."

Technology

The Cuban diplomat confirmed that his country was interested, but he noted that the development of the Cuban microcomputer industry is similar to that of Brazil. Aside from peripherals and software, products for which Cuba has a greater need, there is an interest in importing technology. He does not rule out the possibility of forming mixed companies (joint ventures) between Cuban state companies and Brazilian private or state companies.

"Brazil prefers to sell to developed countries and it is missing out on opportunities," said Cuban Foreign Trade Minister Ricardo Cabrizas, during a meeting with the National Confederation of Industry, in Rio de Janeiro. "We want to make up for the time lost with Brazil over the last 20 years. Brazil has the lowest prices in Latin America."

Service

Encouraged by the results of the first international experiences, some businesses which are Assespro members are going to sponsor a meeting this month in Rio de Janeiro, to examine the possibility of approaching the Cuban market. Eduardo Gutierrez, international affairs director of Assespro-Nacional, who is director of EPD Processamento de Dados e Sistemas de Informatica, notes that Cicon and Engepel, Minas Gerais companies, are mounting a joint venture with Argentine firms for the installation of a service bureau in Buenos Aires.

"The Cuban market looks very attractive," Gutierrez says. "This experience in Argentina will sertainly serve as the basis for a more organized approach to Cuba."

"Cuba has made important progress in the computer area," said First Secretary Idelso Espinosa. "Our greatest need is machines, equipment and technology. We know that Brazil has opted for development in the computer area in a direction similar to ours and also has its own technology. We also have qualified personnel, which makes it easier for us to interface."

Accord Possible

Rio de Janeiro O GLOBO in Poruuguese 20 Nov 86 p 34

[Text] Luiz Octavio Vieira, coordinator of the Foreign Trade Committee of the CNI (National Confederation of Industry), said yesterday that the first visit by Brazilian businessmen to Cuba following resumption of diplomatic relations presented good results; some negotiations were conducted and, more important, prospects were opened for a flow of business estimated at $200 million (about 2.8 billion cruzados), at least one-third of which could be transacted in the first year of trade.

Luiz Vieira said he believes there is a possibility of a Brazilian-Cuban cooperation accord in the area of computers and biotechnology. The Cubans are quite advanced in the production of Interferon and could also pass socialist computer technology on to Brazil. They are producing "displays," keyboards and videos, using GDR technology.

On this first trip, Vieira reported, the Cubans purchased 144 Consul air conditioning units, tubes and connectors from Cofap, textiles from Moinhos Santista, carbide from White Martins and asbestos sheet. The Brazilian businessmen mainly purchased products in the textile and computer areas. Luiz Octavio added that there is an idea of studying the possibility of an accord similar to that of ALADI [Latin American Integration Association].

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